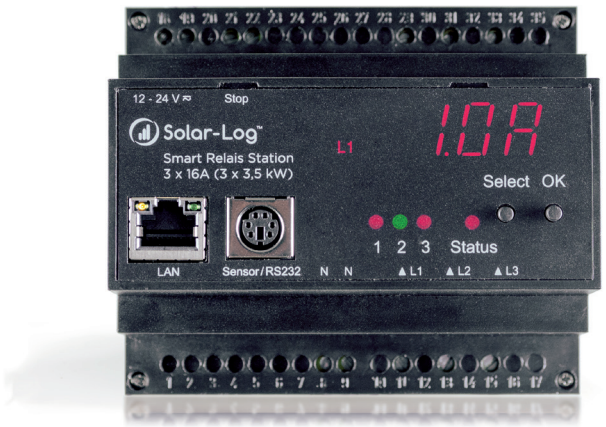
Solar-Log™



Functionality and Application examples

Solar-Log™ - Manual Smart Energy

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The Solar-Log™ Manual Orientation

Firmware
5 & 6

- Solar-Log Base Manual (FW 6.x)
- Solar-Log Base Manual (FW 5.x)
- Solar-Log Components Connection Manual (FW 6.x)
- Solar-Log Components Connection Manual (FW 5.x)
- Solar-Log Smart Energy Manual
- Solar-Log Meter Connection Manual
- Solar-Log Feed-In Management Control Manual (FW 6.x)

Opened manual

Further manuals

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1 Introduction

Smart Home (home automation) is a general term for the process of integrating appliances and systems such as heating and lighting as a total plan for residential dwellings with the goal of improving the quality of living, increasing security and using energy more efficiently. This is partially achieved by networking the various systems, controlling them remotely and using automated processes.

Solar Log™ explicitly uses the term "Smart Energy" rather than "Smart Home"

because its main focus is the effective use of self-produced PV energy, which basically means increasing the percentage of self-consumption.
Although effective energy management is also part of the Smart Home concept, the Solar Log™ is not directly connected to various other home automation aspects, such as being able to control windows and doors, but is concerned primarily with energy management within the home or complex as well as managing the amount of energy fed into the grid. Whenever possible, it is recommended to make use

of all of the various options that Solar-Log™ offers in controlling appliances by integrating these into Smart Home systems. This allows energy-intensive processes to be managed and activated during times of higher PV energy production.

Moreover, generators, combined heat and power units in particular, can be controlled in regard to consumption to reduce the amount of electricity purchased from the grid and, in doing so, reducing electric costs.

1.1 Usage Restriction

Devices for the Solar-Log™ Smart Energy systems are not intended for use with health-related or medical devices. All of the switches that can be configured should be checked by the customer.
Thermal devices such as toasters, coffee machines, irons should not be switched on when unattended.

1.2 Why is it important to increase the amount of self-consumption?

Newly installed photovoltaic only receive relatively low feed-in tariff rates. Self-produced power is generally considerably cheaper than power purchased from the grid.
Thus, increasing the amount of self-consumption considerably improves the return from investing in PV power.

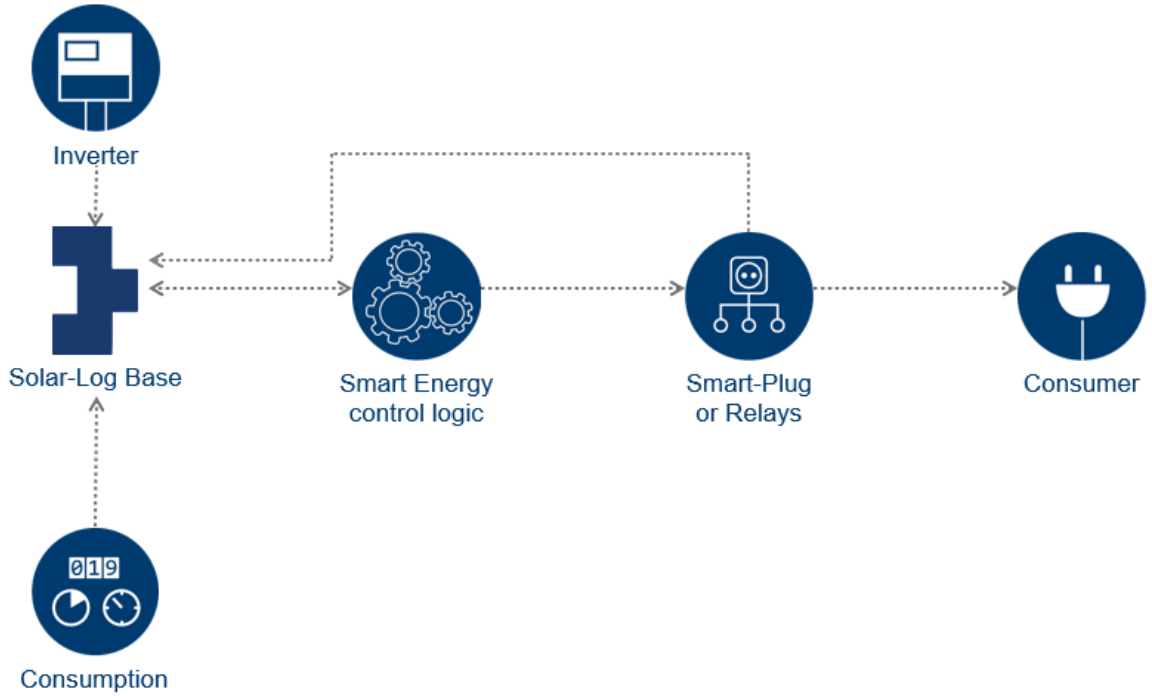
The financial aspects along with the increased degree of self-sufficiency from covering consumption with one's own resources are key motivating factors for PV plant owners to increase the automated use of self-produced power.

1.3 Which appliances are well suited to help increase the use of self-produced power?

This central question has to be examined for different application scenarios.
The number of appliances that it makes sense to manage is limited in private households.
It makes little sense in our opinion to control a washing machine, as mentioned often in the media as an example of a smart appliance. The consumption of washing machines with the energy efficiency class of A is around 1 kWh per wash load. Thus the savings potential for such devices is relatively limited. Heat pumps and air-conditioning systems, on the other hand, offer a lot of potential in typical private households.
For small and medium-sized companies and agriculture, the numerous adjustable loads/processes offer a much higher potential to optimize consumption and increase the savings.

2 Functionality of Smart Energy

The Solar-Log™ offers a multi-level system to manage different appliances.



Schematic setup of Smart Energy logic in the Solar-Log™

Smart Energy consists of four main areas:

- Surplus Calculation in the Solar-Log™
- Smart Energy Functions (Control Logics)
- Smart Energy Devices (Smart Plugs or Relays)
- Smart Consumers (AC-ELWA-E and IDM Heat Pumps)

Individual requirements for switching loads on and off can be implemented with the Smart Energy logics. Pre-configured logics are available for different applications and can be adjusted to the particular circumstances.

Smart energy devices are actors that can freely switch energy flows via load switches (directly or indirectly). A wide variety of Smart Energy devices allows flexibility in meeting customer demands.

We define devices as smart consumers when they can be connected to the Solar-Log™ at the protocol level. The Solar-Log™ transmits the current surplus values to these devices. The intelligent devices decide independently, depending on the set priority, whether or not to use this surplus.

2.1 Surplus

Smart Energy switching operations are usually* based on the calculated amount of surplus power. The surplus is the difference from the produced energy (e.g. from inverters, CHPs, wind turbines etc.) and the consumption. The Solar-Log™ has a direct connection to the inverter(s) and meter(s) to determine this value. Due to the fluctuations in both of these values, a five-minute average value is calculated. A new surplus value is transmitted to the Smart Energy logic every five minutes. The switching commands are triggered according to the configuration.
The devices have a minimum operating time of five minutes due to the average value calculation. This means the switching operations also have a lag responding to this time frame.

Note!

The period of the averaging depends on the number of devices connected to the Solar-Log™ and polling interval and can be vary from 5 to 15 minutes.

* This does not apply to the following profiles:

- Automatic timer: here the appliances are activated for the configured times, without consideration of the amount of surplus.
- Performance Visualization: This profile is based solely on the production. Self-consumption is not taken into consideration with this profile.
- Surplus visualization: This function is only for the visualization and no loads may be switched on since the Solar-Log™ would then have incorrect calculations which would lead to faulty switching operations.
- Consumption visualization: This function is only for the visualization and no loads may be switched on since the Solar-Log™ would then have incorrect calculations which would lead to faulty switching operations.

2.2 0% Feed-in = no surplus

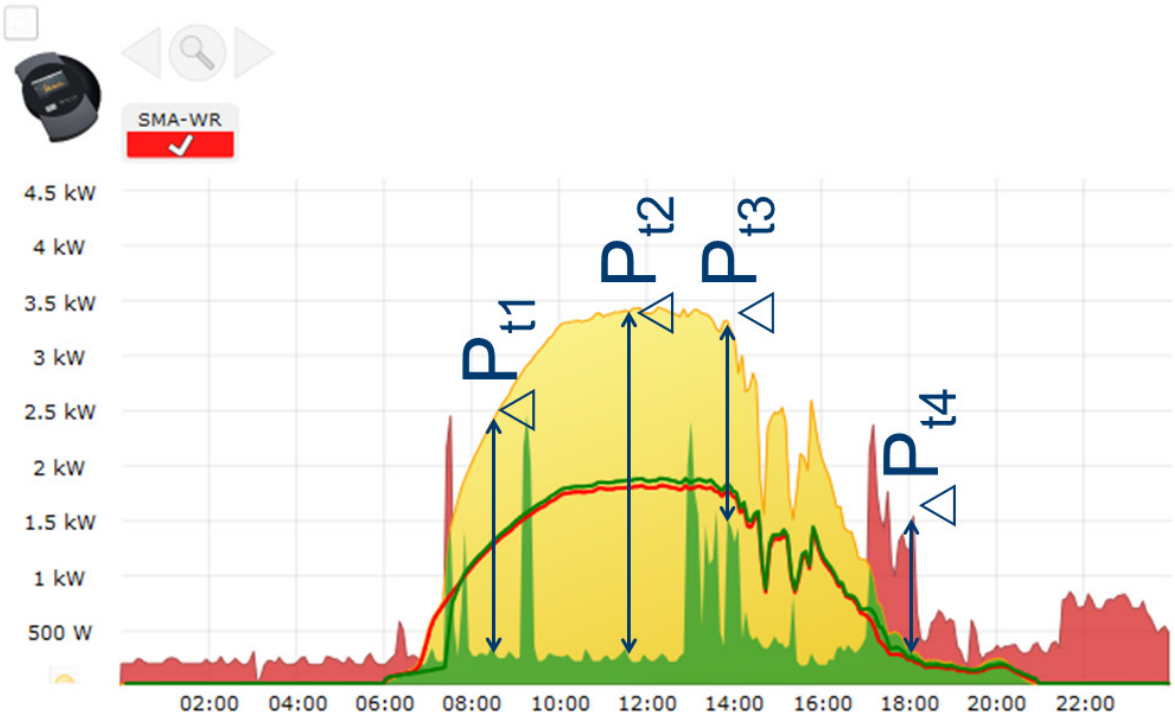
For the special case that no electricity is to be fed into the grid and that the PV installations have been designed purely for self-consumption, there is never a surplus because the entire output from the inverters is for consumption.
A theoretical surplus could occur when the adequate irradiation is available.

The Solar-Log™ can be equipped with a sensor for such cases. The sensors record the theoretical surplus which is used for Smart Energy decisions for profiles based on the calculated surplus.

2.3 Calculation of the Thresholds

Many Smart Energy logics operate with thresholds, but how are these thresholds determined?

As previously described, the surplus is defined as the average of the amount of power remaining from production after consumption has been factored in at a particular time.



This results in the following surplus values for the times 1-4:

Calculation Examples

	t1	t2	t3	t4
Production	2360 W	3380 W	3300 W	285 W
Consumption	323 W	293 W	1510 W	1520 W
Surplus	2028 W	3087 W	1790 W	-1238 W

The typical nominal power rating of the appliances to be managed serves at the basis for the switch-on threshold. In general, the following applies: When the surplus is larger than the configured switch-on threshold, the appliance is turned on.
The appliance is turned off as soon as the remaining surplus reaches the switch-off threshold.
As displayed in time point t4, the surplus can also be negative. This would be a case when electricity was also purchased from the grid. Thus, negative thresholds can also be defined.
If an appliance with a nominal power rating of 1200W is to be managed by the Solar-Log™, the following threshold values are recommended:
Since the amount of surplus fluctuates due to the fluctuation in production and basic consumption, it is recommend to set the threshold a bit higher than the typical nominal power rating of the appliance. In this case, an addition of 10% is advisable. So in our example, the turn-on threshold should be defined as 1350W.

The switch-off threshold cannot be manually configured; it is calculated based on the switch-on value by taking the configured hysteresis into consideration.
The switching hysteresis is to prevent that the switch will be permanently turned on/off at the threshold. It is recommended to have a hysteresis of 100 to 1000W depending on the switch-on threshold.

The switching hysteresis could be set to 150W in this example. The values are calculated as follows:
a switch-on threshold at 1350W and a hysteresis at 150W results int a switch-off threshold of 1200W.

By increasing the hysteresis, the switch-off threshold can also be a value below the nominal power or even a negative value. This means that the appliance is only turned off when the amount of power purchased from the grid reaches the nominal power threshold. This setting ensures that a process that has started is completed before being powered down.

Depending on how the threshold values are defined, it can be determined if an appliance is to be powered with self-produced power in any case, or, if need be, also with electricity purchased from the grid.
This can require control and adjustment of the threshold values during operation.
The same setup can be used for several devices since the consumption from the appliances already turned on is recorded by the consumption meters. Therefore, the calculation of the threshold values per switch is always identical.

2.4 Diagnostic Function

Several analysis options for the configured Smart Energy devices and the related Smart Energy functions are available in the Diagnosis | Smart Energy menu.
The Solar-Log™ Manual provides a detail description of these functions in chapter "Smart Energy."

3 Smart Energy Functions (Logics)

3.1 Defining Smart Energy Switching

The switches that are to be used for the Smart Energy function - switching on appliances in certain consumption or production scenarios - have to be defined and configured.
These switches, as described below, can be configured under the device class definition.
Up to 10 switches are available. They can be assigned to either the same manufacturer/model or to different combinations of manufacturers/models.

Procedure:

- Go to the Configuration | Devices | Definition menu. Go to Interface assignments on ➕ and select Switch for the device class.

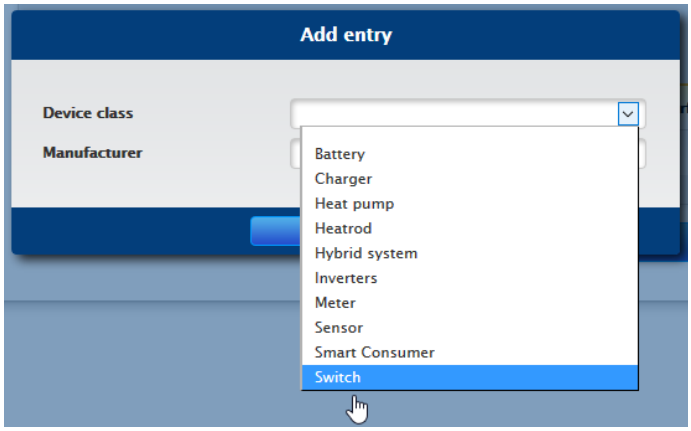


Fig.: Selecting switch for Smart Energy

- The Manufacturer box is displayed. The following selection manufacturers are available:
  - AllNet
  - Belkin
  - Gude
  - Solar-Log

- After that, the Type has to be defined. Depending on the selected manufacturer, all of the supported models can be selected here.
  - Allnet:
    - 3000RF
    - 3073
    - 3075/3076
    - 3075/3076V2
    - 3075V3
  - Belkin:
    - WeMo Insight
    - WeMo Socket

- Gude:
  - 1002
  - 1100/1001
  - 2104
  - 2110
  - 2301
- Solar-Log:
  - Relay (only Solar-Log 1000, 1200, 1900 and 2000)
  - Smart Relay Box
  - Smart Relay Station 1x 3.5kW
  - Smart Relay Station 3x 3.5kW

After that, the number of devices still has to be defined; up to 10 devices are available in total. The Smart Relay Box is the only exception here, instead of the device number box, the interface has to be selected.

- If the definition is complete, confirm by selecting OK.
- Define additional switches in the same way.
- Start the detection after the interface definition.
- Configure the switches after detection.

Note!

This detection differs from the inverter detection in that it does not proceed according to the principle of the search, but a device is set up for every defined switch.

After they have been detected and configured, the switches are available in the Hardware section under Configuration | Smart Energy | Switch groups and can be assigned to switch groups.

3.2 Configuring the Switches

Switches are configured in the Configuration | Devices | Configuration | Configuration menu. Device and meters are to be configured in this menu.

The actual maximum power input is defined in the nominal power (W) under Device in the Module field, power & label menu. Depending on which switch is used, the correct value is normally already entered here. A unique name can be entered for each device in the label box.

If the switch is to be used for Smart Energy management, the connected output (W) has to be additionally defined for each switch contact. This value in this box serves as the basis to calculate the surplus regulation. This value is used for the contacts that report the current output if the connection to the switch is temporarily interrupted.

Note!

The number of contacts depends on the device connected. If the switch does not support output measurements, the device nominal power (W) box is omitted.

Note!

This detection differs from the inverter detection in that it does not proceed according to the principle of the search, but a device is set up for every defined switch.

After they have been detected and configured, the switches are available in the Hardware section under Configuration | Smart Energy | Switch groups and can be assigned to switch groups.

3.3 Smart Energy Switching Groups

There are two tabs under Configuration | Smart Energy:

- Switching groups
- Surplus management

The Switching groups menu is divided into the following sub-sections:

- Hardware
  All of the detected switches are displayed in this section.
- Switching groups
  The switch contacts for the switching groups can be added in this section and new switching groups can be created and configured. Switching contacts in the switching groups are activated by the Solar-Log™. Unassigned contacts are only recorded – as long as the values can be recorded (depends on the hardware). Up to 10 groups are available. Up to eight contacts can be assigned to each group.

3.3.1 Creating switching groups

There are two ways to create a switching group:

The first method:

- Left-click on the "Create switch contact here via Drag & Drop" box.

The second method:

- Drag a defined switch from the hardware section to the "Create switch contact here via Drag & Drop" box.

The next steps are identical for both methods.

- A new window with settings appears. Here, the switching group can be given a name and assigned the operating mode "consumer" or "generator."
- Save the settings by clicking on "Continue."
- The switch group is now visible.

(See illustration: "Creating switching groups")

Click on the Demo box to start the corresponding help for the procedures. (The Demo box is only visible once a switch has already been created.)

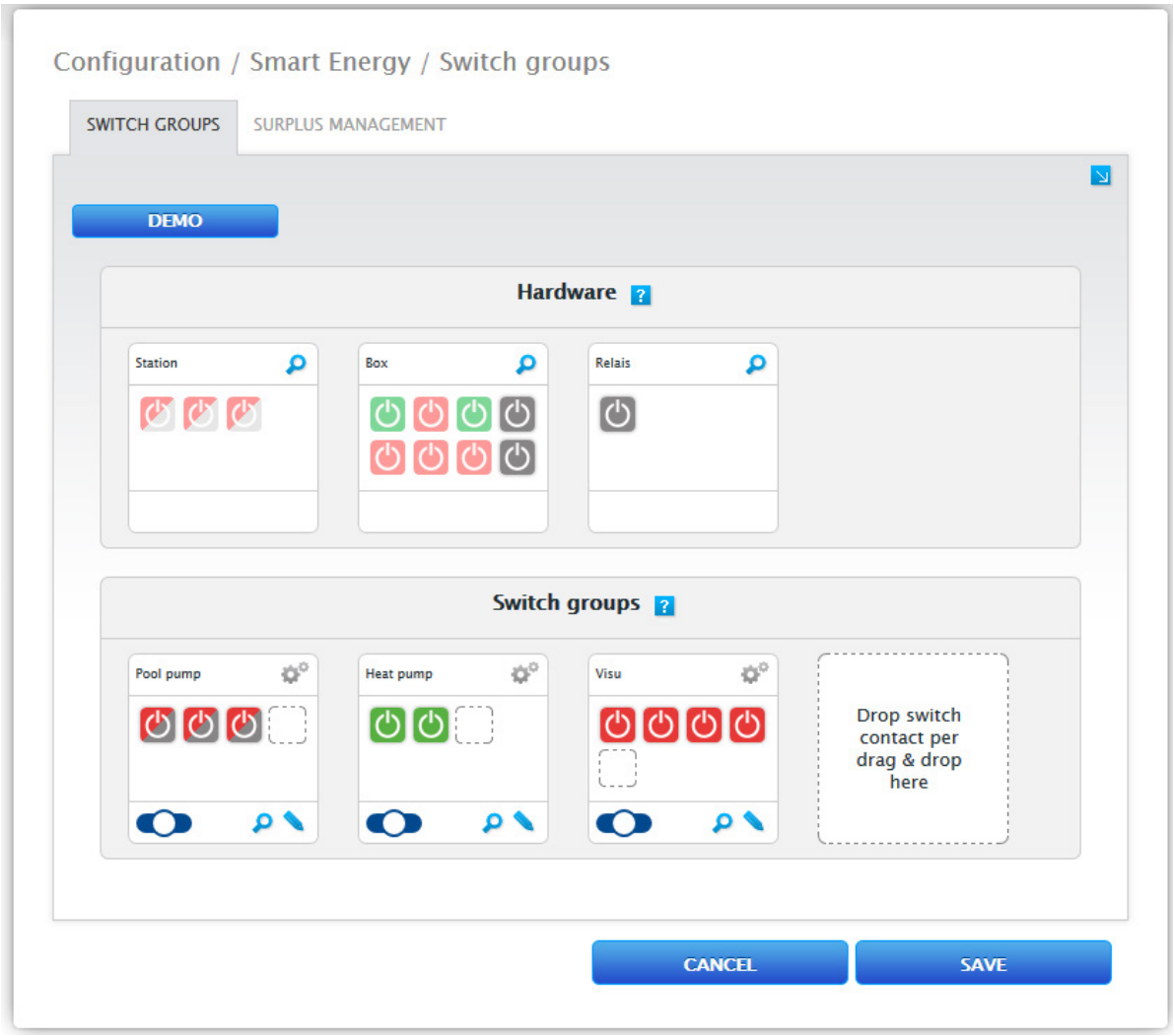


Fig.: Creating switching groups

With the help of the symbol, the "current measured values" (see note) can be displayed in the hardware section and the "configured control logic" in the software section (if nothing has been configured, the control logic "Surplus control" is displayed by default).

Note!

Click on this symbol to display all of the hardware data that can be accessed and recorded by the Solar-Log™ and to display the target state.

Switch states / Color Definition

The switching state of each contact is displayed with the following symbols:

Symbol	Explanation Text	Notes
	Target state: On Actual state: On Everything OK	If the hardware does not support the current state being read, this symbol is also used to clearly identify a fault case.
	Target state: Off Actual state: Off Everything OK	If the hardware does not support the current state being read, this symbol is also used to clearly identify a fault case.
	Target state: On Actual state: Off	For example: The Solar-Log™ determined that the switch should be activated (e.g. surplus reached), but the command was not sent to the switch. This can only happen when the switching state can be read. => This state is temporarily valid, but not a longer period without a change. (e.g. the switch does not accept the switching command.)
	Target state: Off Actual state: On	For example: The Solar-Log™ determined that the switch should be deactivated (e.g. surplus too low), but the command was not sent to the switch. This can only happen when the switching state can be read. => This state is temporarily valid, but not a longer period without a change. (e.g. the switch does not accept the switching command.)
	Switch state: None Actual state: Unknown	The switch is not assigned to a group. => No target state The switch state cannot be read or the switch is not available. => If no state can be read (hardware does not support this), everything is ok. => Otherwise the hardware is not available (fault).
	Target state: On Actual state: Unknown Error	The switch state can be read, but the hardware is unavailable.
	Target state: Off Actual state: Unknown Error	The switch state can be read, but the hardware is unavailable.
	Target state: None Actual state: On Everything OK	The switch can be read, but the switch is not assigned to a group. => No target state
	Target state: None Actual state: Off Everything OK	The switch can be read, but the switch is not assigned to a group. => No target state

The current switching states are display within a few second and are continuously updated.

Switch definitions

There is the option to assign one of the following states with a mouse click.
(See illustration: "Adjustable switch with help text"):

- All of the contacts are permanently switched off (switch position "left").
- The contacts are switched on according to the configured automatic switching rule.
- All of the contacts are permanently switched on (switch position "right").

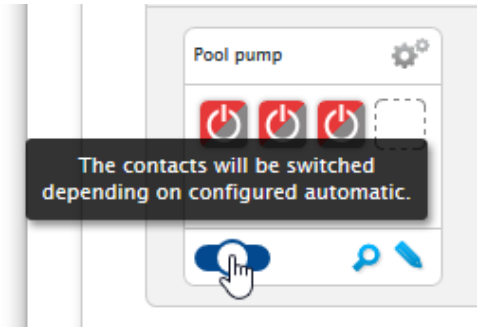


Fig.: Adjustable switch with help text

It is only possible to configure switching groups in the switch position "The contacts are switched according to the configured automatic switching rule. The editing pencil for the switching group is not visible for the other two options. If the switch is set to one of the other modes, the configured logic remains and is active once the mode has been set back. Click on the gear icon to change the name of the switching group, delete it or adjust the mode.

3.3.2 Configuring switching groups

Use this symbol to configure the switching group. The following window appears after clicking on the symbol:

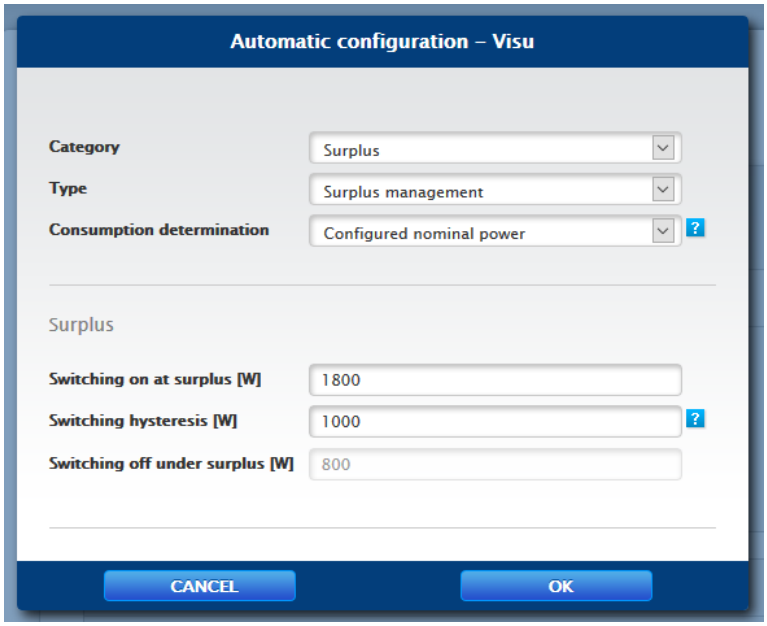


Fig.: Control logic configuration window

The configuration is divided into two section. The top section contains the following boxes:

- Category
- Type and
- Consumption determination. If the Consumption meter option is selected for the Consumption determination, an additional selection box is displayed with all of the available (sub) consumption meters. For the temperature profiles, an additional selection box is displayed with all of the available temperature sensors.

The bottom section is automatically determined by the selected category.

3.3.3 Control Logics Definition - Operating Mode Appliances

Various control logics can be defined with the input boxes.
The individual boxes can be combined differently, depending on the control is used.
The following rules can be selected from the Category box:

- Surplus
- Production
- Consumption
- Device-specific
- Other

Depending on the rule, different types can be set.

Surplus

The following types can be configured under the Surplus category:

- Surplus management
- Surplus management and Temperature Control
- Surplus management and Time Control
- Surplus management and Runtime Control
- Surplus matrix
- Surplus visualization

Surplus management:

The following consumption definition can be selected in the Surplus management section:

- Configured nominal power:
  Consumption is calculated from the configured nominal power for the contacts and the switch state. The nominal power can be defined in the Module Fields, Power Output and Descriptions section of the Configuration | Devices | Configuration.If it is available, the current state is used for the calculation, otherwise the target state.
- Measured value from the contacts (can only be selected if at least one contact that provides output values has been assigned to the switching group. This depends on the hardware used and can be viewed by clicking on the magnifying glass icon in the hardware section under Configuration | Smart Energy | Switching groups):
  Consumption is determined by the measured consumption from the individual contacts as long as these values are provided. This is determined by the configured nominal power for contacts that do not provide these values or when communication is offline.
- Consumption meter:
  Consumption is determined by a separate consumption meter that has to be detected as a device. If this type of consumption determination is selected, the responsible consumption meters also have to be selected.

After the consumption determination has been selected, the threshold values have to configured in the last step.

- Switching on at surplus [W]
- Switching hysteresis (W)
  The switching hysteresis is to prevent that the switch will be permanently turned on/off at the threshold. It is recommended to have a hysteresis of 100 to 1000W depending on the switch-on threshold.
- Switching off under surplus [W] (This value is grayed out and cannot be manually modified. It is calculated from the "Switching on at surplus [W]" value minus the "Switching hysteresis (W)" value.)

Example profile for surplus management in reference to switching hysteresis

Profile definition	
Switching on at surplus [W]	800
Switching hysteresis [W]	200
Switching off below [W]	600
Actual profile consumption [W]*	500

*is either determined as a measured value or the taken from the defined nominal power.

Note!

The action always takes place after the decision (see table below).

Time	Production	Consumption			Value at the grid connection point	Solar-Log™ Internal procedure		Explanation Text
	PV	Total consumption meter	Home consumption	Consumption Profile	Grid point	Theoretical surplus	Switching operation	
1	0	0	0	0	0	0		
2	1000	0	0	0	1000	1000	0	PV plant turns on
3	1000	500	0	500	500	1000	1	Profile 1 turns on
4	1000	500	0	500	500	1000	1	
5	1000	700	200	500	300	800	1	Home consumption is added
6	1000	950	450	500	50	550	1	Home consumption increases
7	1000	450	450	0	550	550	0	Profile 1 turns off
8	1000	0	0	0	1000	1000	0	

Glossary

Consumption Profile	corresponds to the power consumption of the managed device.
Value at the grid connection point	energy fed into or purchased from the grid.
Theoretical surplus	corresponds to the production minus the household consumption (without taking the profile consumption into consideration).
Total consumption meter	The values here are calculated based on the household consumption and consumption profile.

Surplus management and Temperature Control

This Consumption determination is almost completely identical to that of Surplus management. The only difference is that the temperature sensor has to be selected.

After selecting the Consumption determination, the following sections are to be configured:

- Surplus
- Temperature

The Surplus configuration (see Surplus management).

The following settings can be made and/or activated under temperature configuration:

- Switch on when temperature is (C°):
  - greater
  - less
- Runtime (min.):
  If the appliance was activated because of the temperature threshold, it will be deactivated after this time has passed, even if the minimum/maximum temperature has not been reached.
- Target Temperature (C°):
  If the appliance was activated because of the temperature threshold, it will be deactivated after this temperature has been reached, even if the minimum/maximum temperature has not been reached.
- Minimum/Maximum temperature (C°) (depends on the selection for "Switch on when temperature is (C°) greater or less"):
  It is applied even if the appliances are activated because of a surplus or the temperature.

Surplus management and Time Control

This Consumption determination is identical to Surplus management.

After selecting the Consumption determination, the following sections are to be configured:

- Surplus
- Time

The Surplus configuration (see Surplus management).

Up to two daily runtimes can be set in the time configuration. If only one runtime is needed, the second one can be removed by clicking on the trash can symbol. The runtimes can be defined beyond just one particular day.

Surplus management and Runtime Control

This Consumption determination is identical to Surplus management.

After selecting the Consumption determination, the following sections are to be configured:

- Surplus
- Daily runtime

The Surplus configuration (see Surplus management).

The following settings can be made and/or activated under Daily runtime configuration:

- Daily runtime [Min.] (this values is determined by the time from 0:00 to 23:59.)
  - Minimal
  - Exact
  - Maximal
- Fill runtime from
  Depending on the situation, it could happen that the period of time from the defined daily runtime could not fulfilled with the surplus rule. In this case, it can be defined in this box at which time the remaining daily runtime should be fulfilled. The process is also carried out when there is no surplus available.
- Minimum continuous switch on time [Min.]
- Minimum continuous switch off time [Min.]
- Max. switch on operations
  The remaining daily runtime is completely fulfilled with the last switching run.

Note!

The daily runtime will be set to the value of the new day starting at 0:00 (midnight).
That is why it is not possible to have a runtime extending past the particular day. The devices controlled in this section will be turned off at 0:00 (midnight).

Surplus matrix

At least two and no more than three contacts have to be assigned to the switching group to use this function.
This Consumption determination is identical to Surplus management.

In the bottom section, there is a matrix to determine the output of the appliances and with which contacts are linked to in the switching group.
Up to seven surplus levels can be created by clicking on the plus symbol.
Levels that are not needed can be deleted by clicking on the trash can symbol.

Surplus visualization

With Surplus visualization, its own surplus threshold can be configured for every contact (1-8) assigned to the group.

Note!

This function is only for the visualization and no loads may be switched on since the Solar-Log™ would then have incorrect calculations which would lead to faulty switching operations.

Production

With output visualization, its own output threshold can be configured for every contact (1-8) assigned to the group.

Note!

This function is only for the visualization and no loads may be switched on since the Solar-Log™ would then have incorrect calculations which would lead to faulty switching operations.

Consumption

With Consumption visualization, its own consumption threshold can be configured for every contact (1-8) assigned to the group.

Note!

This function is only for the visualization and no loads may be switched on since the Solar-Log™ would then have incorrect calculations which would lead to faulty switching operations.

Device-specific

The following types can be configured under the Device-specific category:

- Heat pump with a grid company blocking signal
- Vaillant heat pump with a grid company blocking signal
- Heating rod three level digital

Heat pump with a grid company blocking signal

Heat pumps can have a control input for a grid company blocking signal. This input is used by grid operators via ripple control receivers to release heat pumps at a certain time. If a heat pump can now be run with PV power, this input can be used to switch on the heat pumps in relation to the amount of power being produced. The relay is then turned off during periods with a PV surplus--when the heat pumps "may" run. When no PV surplus is available, the heat pumps remain deactivated. There are a maximum of three configurable periods available to avoid a cool down during periods with a longer deactivation, e.g. during periods of bad weather. During such periods, the heat pumps are enabled and - if required - power is purchased from the grid.
This profile is defined based on two thresholds and three periods of continuous operation. The periods of continuous operation are defined based on the:

- Time from/to and
- Month from/to.

Vaillant heat pump with a grid company blocking signal

This control logic is especially pre-configured for Vaillant heat pumps. The function and configuration corresponds to the "heat pump with a grid company blocking signal" profile.

Heating rod three level digital

At least two and no more than three contacts have to be assigned to the switching group to use this function.
This Consumption determination is identical to Surplus management.

In the bottom section, there is a matrix to determine the output of the heating coil and with which contacts are linked to in the switching group.
Up to seven surplus levels can be created by clicking on the plus symbol.
Levels that are not needed can be deleted by clicking on the trash can symbol.

Other

The Automatic timer type under Other category operates independent of the current PV production and measured consumption.
Up to ten daily runtimes can be created by clicking on the plus symbol.
Levels that are not needed can be deleted by clicking on the trash can symbol.

Generation Information on Thresholds

Average values (every 5, 10 or 15 minutes) are generated to balance the fluctuations in PV production (e.g. due to clouds) for managing appliances. The average value is aligned to the threshold set in the respective logic control.

General information about nominal power (maximum AC output):

The nominal power (maximum AC output) is the average consumption of appliances that is controlled by the profile. Appliances, such a laundry dryer, have a short high peak of power consumption and times in which little power is required. Based on this, it would be problematic to calculate the current power consumption for power management control. The is why the Solar-Log™ calculates the entire runtime with the value configured for the nominal power (maximum AC output) which can be entered in the Configuration | Devices | Configuration | Configuration in the Module Fields, Power Output and Descriptions section. (See the Chapter "Module Fields, Power Output and Descriptions" under Device Configuration.)

Note!

The most exact that the configured nominal power (maximum AC output) corresponds to the actual consumption, the more accurately the control of consumption via Smart Energy is.

Note!

The configured control rules can be simulated in the Diagnostics menu. Click on the arrow symbol at the top under Configuration | Smart Energy | Switching groups to switch directly to the Smart Energy Simulation.

3.3.4 Control Logics Definition - Operating Mode Generator

Various control logics can be defined with the input boxes. (See the Smart Energy Manual for more details – available for download from our website –
The individual boxes can be combined differently, depending on the control is used.
The following rules can be selected from the Category box:

- Power from the grid
- Other

Power from the grid

The following types can be configured under the Grid Power category:

- Power from the grid
- Power from the grid and Time Control
- Power from the grid and Runtime Control

Power from the grid

The following production definition (production) can be selected in the Grid Power section:

- Configured nominal power:
  Production is calculated from the configured nominal power for the contacts and the switch state. The nominal power can be defined in the Module Fields, Power Output and Descriptions section of the Configuration | Devices | Configuration. If it is available, the current state is used for the calculation; otherwise, the target state is used.
- Measured value from the contacts (can only be selected if at least one contact that provides output values has been assigned to the switching group. This depends on the hardware used and can be viewed by clicking on the magnifying glass icon in the hardware section under Configuration | Smart Energy | Switching groups):
  Production is determined by the measured production from the individual contacts as long as these values are provided. This is determined by the configured nominal power for contacts that do not provide these values or when communication is offline.
- Production meter:
  Production is determined by a separate production meter that has to be detected as a device.

Section Grid Power

After the production determination has been selected, the threshold values have to be configured in the last step.

- Switching on at grid power [W]
- Switching hysteresis [W]
  The switching hysteresis is to prevent the switch from being permanently turned on/off at the threshold. It is recommended to have a hysteresis of 100 to 1000 W depending on the switch-on threshold.
- Switching off below production [W] (This value is grayed out and cannot be manually modified. It is calculated from the „Switching on at grid power [W]“ value minus the „Switching hysteresis (W)“ value.)

Power from the grid and Time Control

This production determination is identical to that of the grid power

After selecting the production determination, the following sections are to be configured:

- Power from the grid
- Time

The configuration of grid power (see the section „Grid Power“ above).
Up to two daily runtimes can be set in the time configuration. If only one runtime is needed, the second one can be deleted by clicking on the trash can symbol.

Grid Power and Runtime Control

This production determination is identical to that of the grid power

After selecting the production determination, the following sections are to be configured:

- Power from the grid
- Daily runtime

The configuration of grid power (see the section „Grid Power“ above).

The following settings can be made and/or activated under Daily runtime configuration:

- Daily runtime [Min.] (this values is determined by the time from 0:00 to 23:59.)
  - Minimal
  - Exact
  - Maximal
- Fill runtime from
  Depending on the situation, the period of time from the defined daily runtime might not be fulfilled with the surplus rule. In this case, it can be defined in this box at which time the remaining daily runtime should be fulfilled. The process is also carried out when there is no surplus available.
- Minimum continuous switch on time [Min.]
- Minimum continuous switch off time [Min.]
- Max. switch on operations
  The remaining daily runtime is completely fulfilled with the last switching run.

Note!

The daily runtime will be set to the value of the new day starting at 0:00 (midnight).
That is why it is not possible to have a runtime extending past the particular day. The devices controlled in this section will be turned off at 0:00 (midnight).

Other

The Automatic timer type under Other category operates independent of the current PV production and measured consumption.
Up to ten daily runtimes can be created by clicking on the plus symbol.
Levels that are not needed can be deleted by clicking on the trash can symbol.

3.4 Smart Energy Surplus Management

The Surplus Management menu is divided into the following sub-sections:

- Settings
- Surplus priority

(See illustration: “Surplus management”)

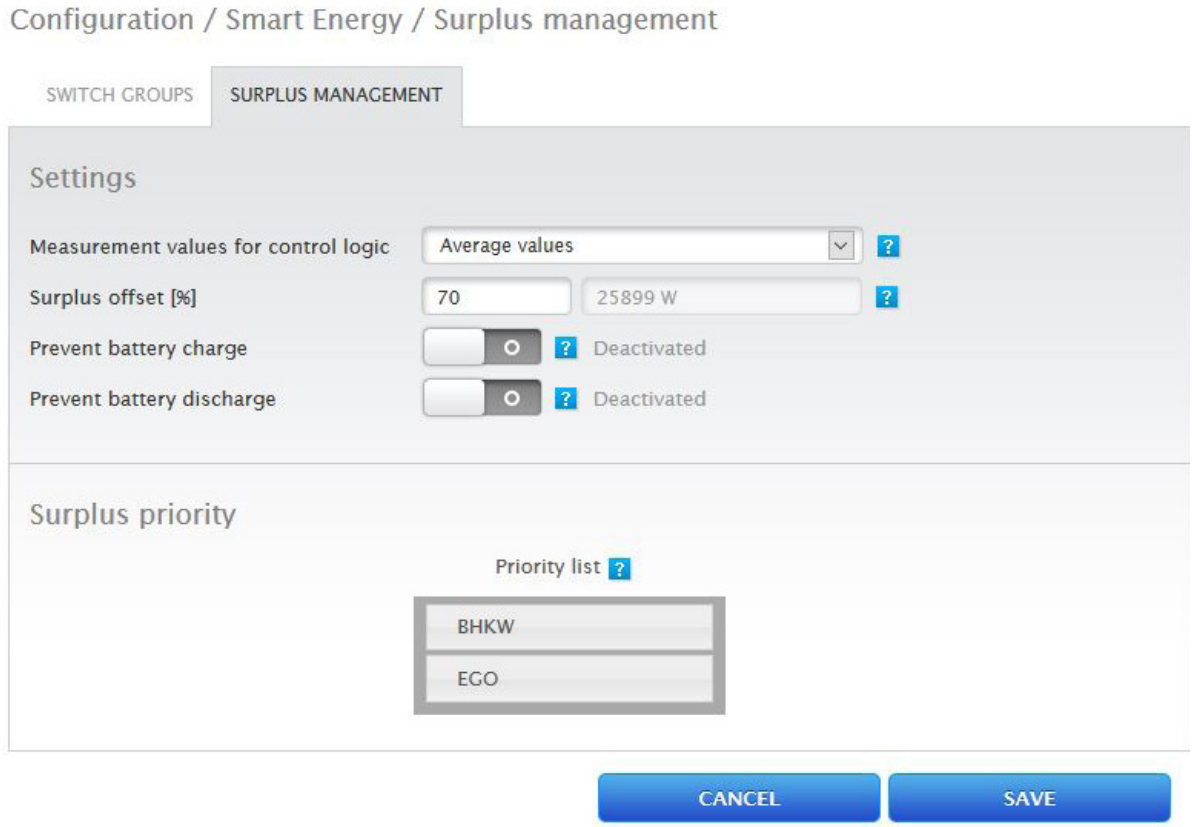


Fig.: Surplus management

The following values can be defined in the Settings section:

- Measurement values for control logic
- Surplus offset [%]
- Battery charging suspension (only displayed when a hybrid or battery system has been detected)
- Battery discharging suspension (only displayed when a hybrid or battery system has been detected)

The following values for the control logic can be selected under Measurement values for control logic:

- Current values
  are the instantaneous values. For systems with constant measurements values (e.g. CHP as producer), current values can also be used to react more quickly.
- Average values
  Average values compensate for power fluctuations and help the control logic to operate more steadily.

Note!

Depending on the number of connected inverters, the average value is based on 5, 10 or 15 minute values.
< 30 INV: 5 minutes, 30-59 INV: 10 minutes, >= 60 INV: 15 minutes

Battery charging suspension

When activated, the Solar-Log™ switches appliances on to prevent the battery from being charged. The battery will only be charged when the respective appliances are deactivated again or when there is still a power surplus despite the consumption from the appliances.

Battery discharging suspension

When activated, the Solar-Log™ turns on the generators to provide enough power production to cover the amount required for consumption. This means that the battery is only discharged when the power production cannot cover the consumption.

Note!

The “Battery (dis)charging suspension” options are only available when a hybrid or battery system has been detected and are deactivated unless production/consumption controls have been defined.

Surplus offset [%]

How much nominal plant output is to be fed into the grid and how much should be used for the Surplus manage of the Smart Energy control logics can be defined in this box.
When output reduction is activated, a sensor has to be installed to determine the amount of theoretically available production.

In the Surplus priority section, the list of defined switching groups and the detected intelligent appliances are displayed according to their priority (the first entry in the list has the highest priority). This can be adjusted at anytime with the drag and drop function.

Note!

The prioritization occurs only for the surplus profiles and not, for example, for the runtime control profiles.

4 Smart Energy Devices

Various hardware is available for Smart Energy devices.

All of the devices have the feature that the Solar-Log™ can communicate with them and control their operations. These devices can be classified into three groups:

- Low Power Switches
- Power Relays
- Smart Plugs

Because smart appliances are not controlled with the Smart Energy functions (logics), they are listed separately below.

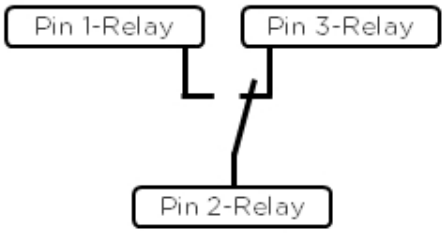
4.1 Low Power Switches

These devices are ideally suited for generating potential-free signals. When used in combination with power relays, they can also switch large loads.

4.1.1 Internal Relay

The internal relay is the most basic switch. All Solar-Log 1000, 1200 and 2000 devices are equipped with this relay and can be used for simple switching.

A 230 V appliance has to be connected via another load relay.



Internal relay wiring diagram

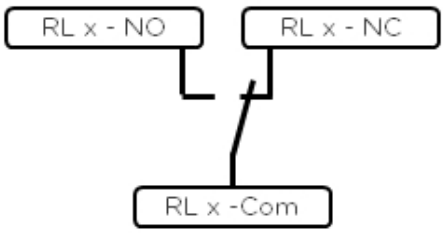
Internal Relay	
Switching contact type	1 x changeover contact
Contact rating	24 VDC 5 A
Connection to the Solar-Log™	Terminal block connector

Technical specifications of the internal relay

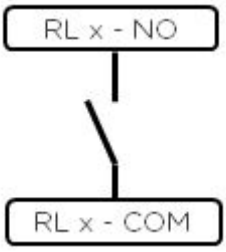
4.1.2 Solar-Log™ Smart Relay Box

The Solar-Log™ Smart Relay Box comes with 8 relays (4 changeover and 4 closing) and can be connected to the Solar-Log™ with an RS485 connection.

The relays can be activated individually or in combination with the Smart Energy logics. This makes the device ideal for controlling heat pumps and for visualizing the performance.
Large appliances can be directly switched by this device. In this example, the adapted load relays have to be interposed to the load. The load relays can then be controlled with the Solar-Log™ Smart Relay Box.



Change-over contact wiring diagram



Make contract wiring diagram

Solar-Log™ Smart Relay Box	
Switching contact type	4 x changeover contact 4 x closing contacts
Contact rating	0.5 A @ 120 V_{AC} 0.25 A @ 240 V_{AC} 1 A @ 30V_{DC} 0.3 A @ 110V_{DC}
Connection to the Solar-Log™	RS485 without other devices

Technical specifications of the Solar-Log™ Smart Relay Box

4.2 External power relays

External power relays are connected to the Solar-Log™ with a network connection.

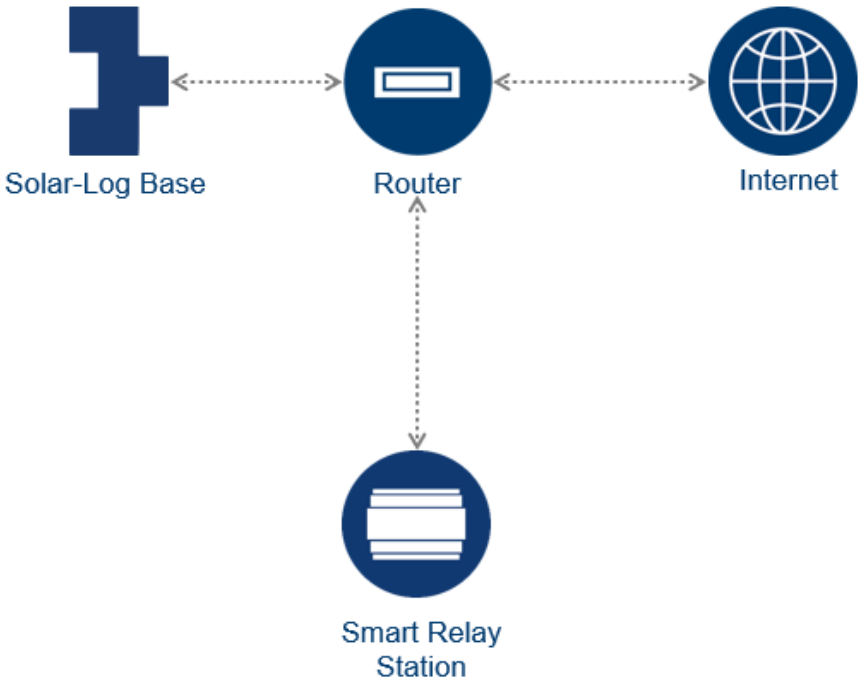
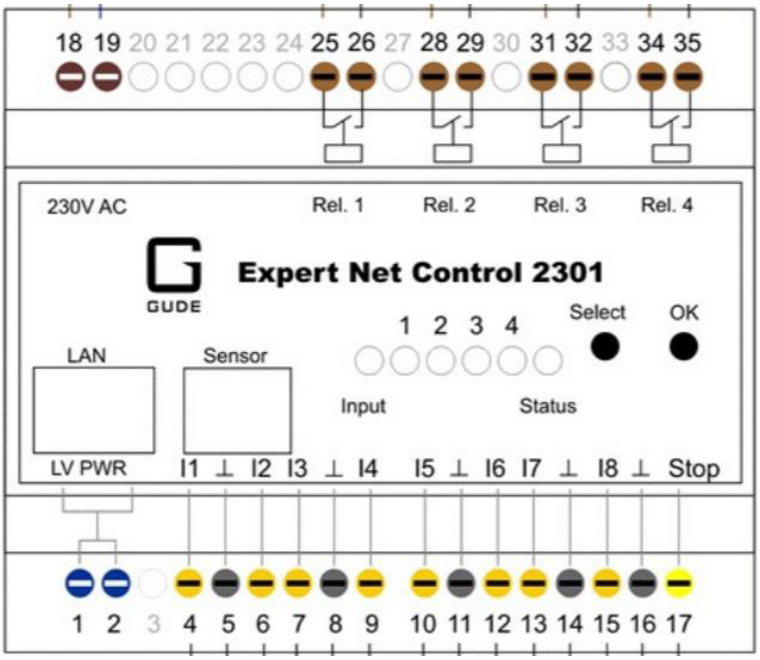


Diagram of the network layout with the Solar-Log™ and Smart Relay Station (valid for all networked switches)

A characteristic of these switches allows switching only of appliances with line voltage and maximum power consumption of 16 amps can be directly switched. The devices are intended for installation in meter cabinets or in a sub-distribution unit. The appliances are connected directly by cable. In addition to the switching operation, the consumption of the switched load is also recorded with the Solar-Log™ Smart Relay Station. For this reason, the Solar-Log™ Smart Relay Station can also be used as a sub-consumer meter and displayed in the Solar-Log™.

4.2.1 Gude Expert Net Control 2301

The Gude Expert Net Control 2301 offers the option to switch four appliances directly (max. 16A). The power relay is connected to the Solar-Log™ with a network connection.



Block diagram of the Gude Expert Net Control 2301 (Inputs 4 to 17 are not supported by the Solar-Log™)

Gude Expert Net Control 2301	
Switching contact type	4 x closing contacts
Contact rating	16 A @ 250 V_{AC} 10 A @ 24V_{DC}
Connection to the Solar-Log™	Network
Other	Switch status indicator on the device

Note!

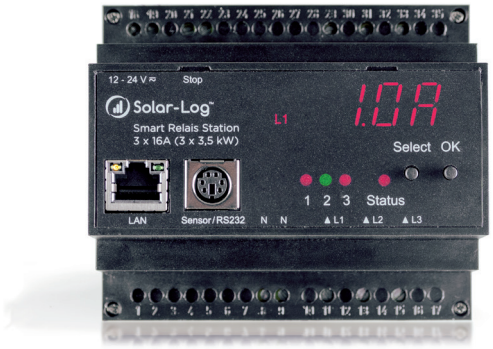
Three-phase loads cannot be switched with this device because the relays do not switch synchronously. Switching contacts are not measured.

4.3 Solar-Log™ Smart Relay Station

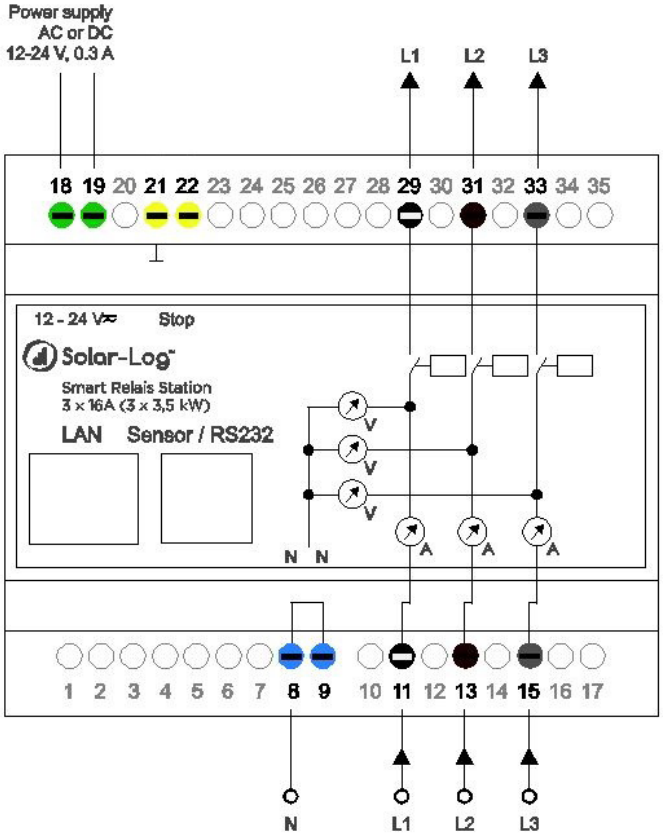
The Solar-Log™ Smart Relay Station was specially developed by Solar-Log™ for the optimization of self-consumption. Two versions (1 x 16A and 3 x 16A) are available. A special additional feature of these devices beyond just switching loads is the integrated measuring of the individual switching channels. This allows the connected switched appliances to be displayed, recorded and visualized by the Solar-Log™ without requiring additional meters or current transformers.

4.3.1 Solar-Log™ Smart Relay Station v2 (3 x 16A)

The Solar-Log™ Smart Relay Station v2 (3 x 16A) offers the option to switch three appliances directly (max. 16A) and to record their individual consumption. This power relay is connected to the Solar-Log™ with a network connection.



Solar-Log™ Smart Relay Station 3 x 16A



Block diagram of the Solar-Log™ Smart Relay Station 3 x 16A

Note!

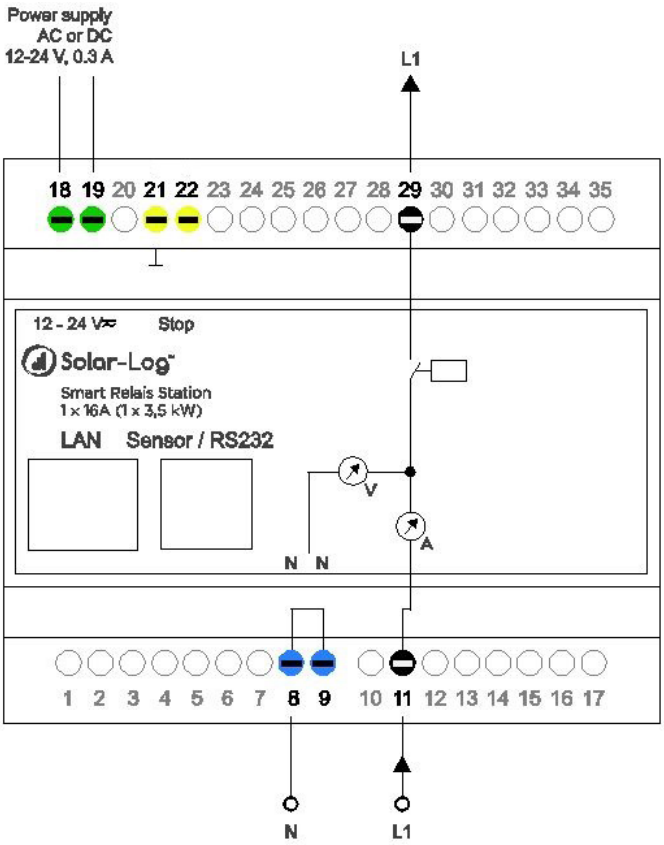
Three-phase loads cannot be switched with this device because the relays do not switch synchronously.

Solar-Log™ Smart Relay Station 3 x 16A	
Switching contact type	3 x closing contact with 3 sub-consumption meter
Contact rating	16A @ 250 V_{AC} 10A @ 24V_{DC}
Connection to the Solar-Log™	Network
Other	Switch status and consumption indicator on the device

4.3.2 Solar-Log™ Smart Relay Station 1 x 16A

The Solar-Log™ Smart Relay Station 1 x 16A offers the option to switch one appliance directly (max. 16A) and to record their individual consumption. This power relay is connected to the Solar-Log™ with a network connection.

Solar-Log™ Smart Relay Station 1 x 16A



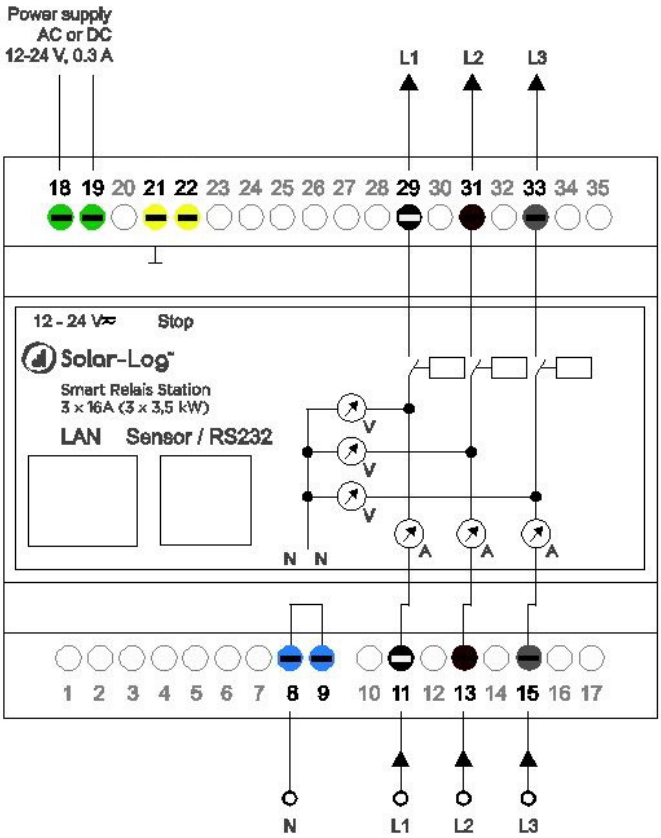
Block diagram of the Solar-Log™ Smart Relay Station 1 x 16A

Solar-Log™ Smart Relay Station 1 x 16A	
Switching contact type	1 x closing contact with 1 sub-consumption meter
Contact rating	16A @ 250 V_{AC} 10A @ 24V_{DC}
Connection to the Solar-Log™	Network
Other	Switch status and consumption indicator on the device

4.3.3 Solar-Log™ Smart Relay Station 3 x 16A

The Solar-Log™ Smart Relay Station 3 x 16A offers the option to switch three appliances directly (max. 16A) and to record their individual consumption. This power relay is connected to the Solar-Log™ with a network connection.

Solar-Log™ Smart Relay Station 3 x 16A



Block diagram of the Solar-Log™ Smart Relay Station 3 x 16A

Note!

Three-phase loads cannot be switched with this device because the relays do not switch synchronously.

Solar-Log™ Smart Relay Station 3 x 16A	
Switching contact type	3 x closing contact with 3 sub-consumption meter
Contact rating	16A @ 250 V_{AC} 10A @ 24V_{DC}
Connection to the Solar-Log™	Network
Other	Switch status and consumption indicator on the device

4.4 Smart Plugs

When we talk about Smart Plugs, we are referring to networked power sockets. They are connected to the Solar-Log™ via LAN or WiFi and allow for the automated switching of the connected appliances.
These networked plugs are especially well suited for small appliances.
Solar-Log GmbH does not produce its own Smart Plugs but offers products from Belkin and Allnet.

4.4.1 Overview of Compatible Smart Plugs

The Solar-Log™ can control networked smart plugs from various manufacturers.

The following devices can be used:

- Allnet 3075 V3
- Allnet 3073
- Allnet 3075/3076 V2
- Allnet 3000 RF
- Allnet 3075/3076
- Gude Power Control 1002
- Gude Export Power Control 1100/1001
- Gude Expert Net Control 2104
- Gude Expert Net Control 2110
- Gude Expert Net Control 2301
- Belkin WeMo Socket
- Belkin WeMo Insight

Please refer to the technical data sheets for the particular device for detailed information.

5 Application Examples

The following examples are some of the many possibilities of the Solar-Log™ in connection with Smart Energy systems. These are just a small select number of examples – the combination of Smart Energy logics and Smart Energy devices offers numerous of possibilities.

5.1 Controlling pool pumps with Smart Plugs

The pool pump should circulate the pool water when there is enough PV energy available.
This example can be applied to any case in which appliances can be controlled via Smart Plugs.

Devices used

The pump in the example has the following characteristics:
The power consumption is 600W with a circulation of 10m³/h.
The pump uses a Schuko plug – which is well suited for a Smart Plug – for its power supply.

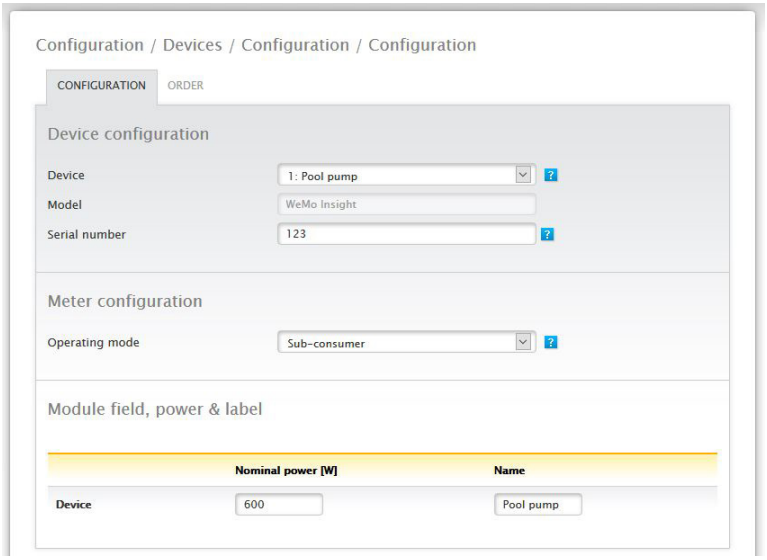
Installation

The installation is rather easy when using a Smart Plug and an appliance that has a regular power connection (Schuko plug). The Smart Plug and Solar-Log™ have to be able to communicate with each other. This can be done via a LAN or WiFi connection.

Schematic system setup (see circuit diagram in the appendix).

Configuration Smart Energy device

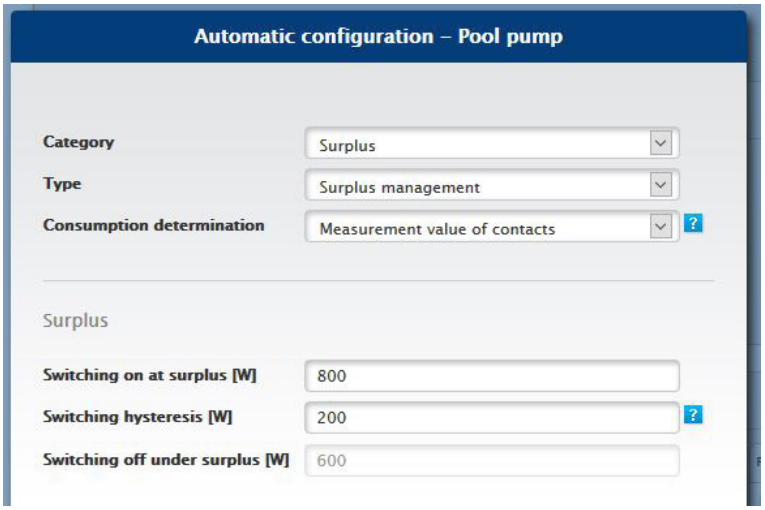
Configure the Smart Plug in the Configuration | Devices | Configuration menu.
In this example, a Belkin WeMo Insight was used.



Configuration of the Smart Plug

Configuration Smart Energy logic

The basic profile type "Surplus management" is suitable to control the pump.
The nominal power rating of the pump is 600W.
The configuration under Configuration | Smart Energy | Switch Groups can be implemented exemplarily (refer to the chapter "Smart Energy Functions" for creating switching groups).



Example for the control logic "Surplus management" for a pool pump

5.2 Controlling heat pumps with a grid company blocking signal

Many grid companies offer special heat pump tariffs for heat pumps. A requirement for this tariff is to allow the grid company the option to block the heat pump. This is generally accomplished with a ripple control receiver from the grid company and a special input on the heat pump.
Recently, this option has been becoming less relevant. If the heat pump is not billed with a special tariff, connecting the heat pump to one's own PV plant is a better way to reduce the operating costs.

Note!

A requirement for the Solar-Log™ to manage the heat pump is that the PV plant is connected to the same grid point and that it is not billed with a separate tariff meter.

Devices used

The heat pump has to be equipped with the proper input. A basic make contract is required for the Solar-Log™. The Solar-Log™ 1000, 1200, 1900 and 2000 devices are equipped with an internal relay that is ideal for this application. The Smart Relay Box can be used with other devices without internal relays.

Installation

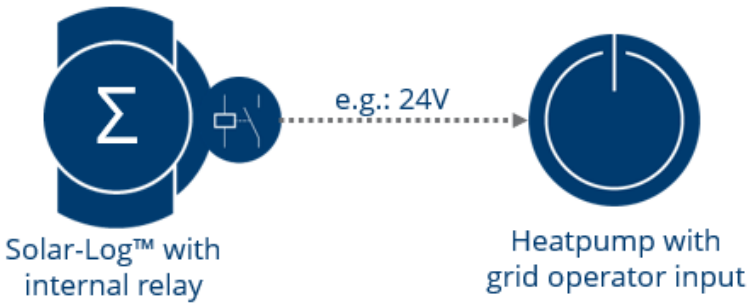
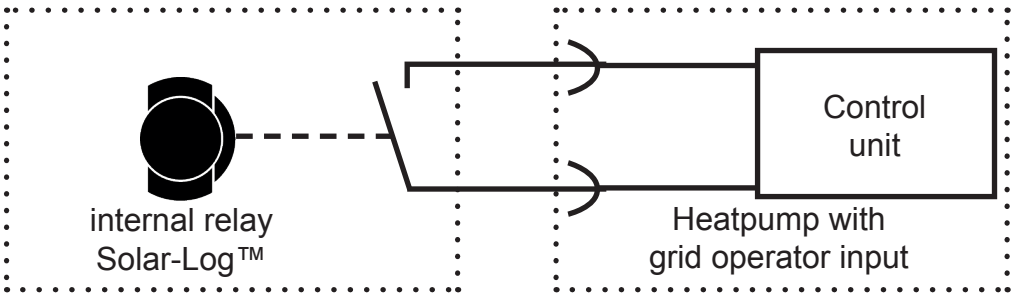


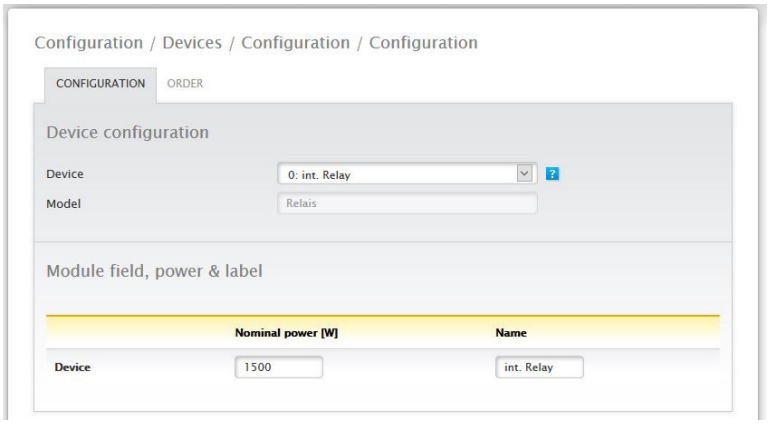
Diagram of the Solar-Log™ and heat pump connection (see circuit diagram in the appendix).



Wiring diagram for controlling a heat pump via the internal replay of the Solar-Log™

Configuration Smart Energy device

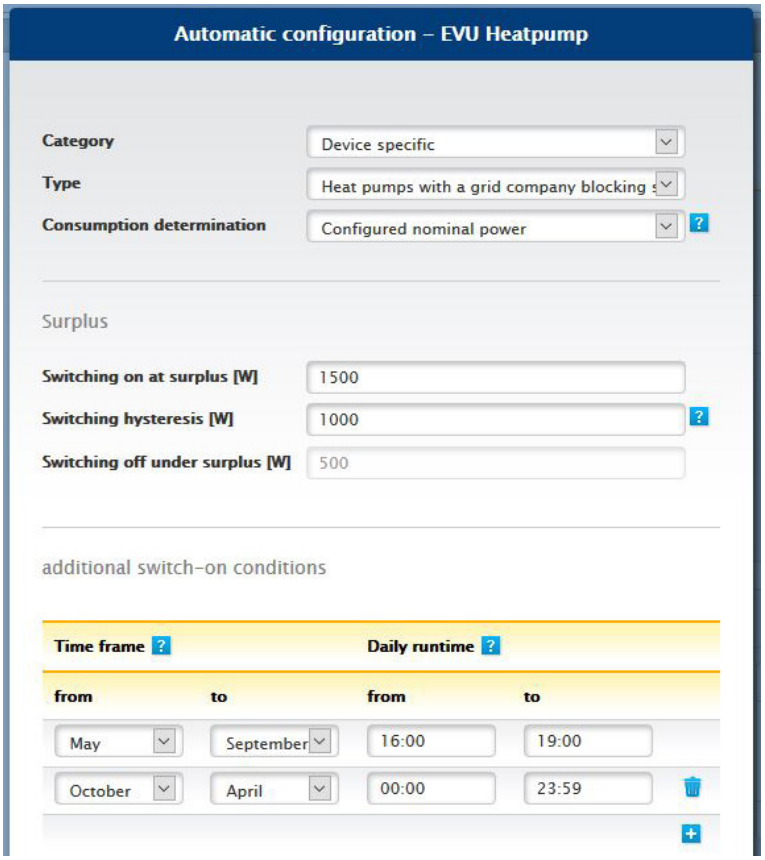
In this case, a basic switch – the internal relay – is used.
Configure the switch in the Configuration | Devices | Configuration menu, as in the screenshot.



Configuration of the internal relay as a Smart Energy device

Configuration Smart Energy logic

There is a special logic "Heat pumps with a grid company blocking signal" for this application under Configuration | Smart Energy | Switching Groups. In this example, we used the make contract of the internal relay as the switch.



Typical configuration of the "Heat pumps with a grid company blocking signal" logic

In this example, the heat pump has a typical nominal power rating of 1500W. Based on the "Upper threshold for activation" settings, the heat pump is cleared to be activated when there is a surplus of 1500W. This does not necessarily mean that the heat pump begins to operate. With a surplus threshold value of 500W, the heat pump operation is blocked again.

The release times can be set up for the three configurable month periods in the "Turn on period" section. In the example, the configured values in "Turn on period" 2 ensure that the heat pump is released the whole day from October to April (10-4). There is no surplus check during this period.

5.3 Controlling Heat Pumps via SG Ready Signals

Using a heat pump is an ideal way to increase the consumption of self-produced power. Modern heat pumps are often equipped with an SG-Ready input or can be upgraded.
SG-Ready compatible heat pumps should have a controller that can implement four operating modes. These four operating modes are implemented via two inputs with binary encoding. Not all manufacturers have implemented this. Some have only implemented two or three operating modes for the heat pumps. This can also be implemented by the Solar-Log™.

Devices used

The Smart Relay Box is ideal to generate this signal in relation to the PV production in connection with the profile "Heatrod 3-stage digital." Freely defined bit patterns can be generated.

Installation (general)

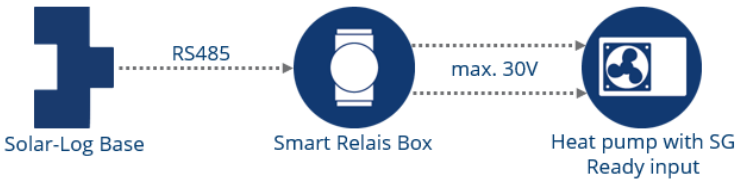
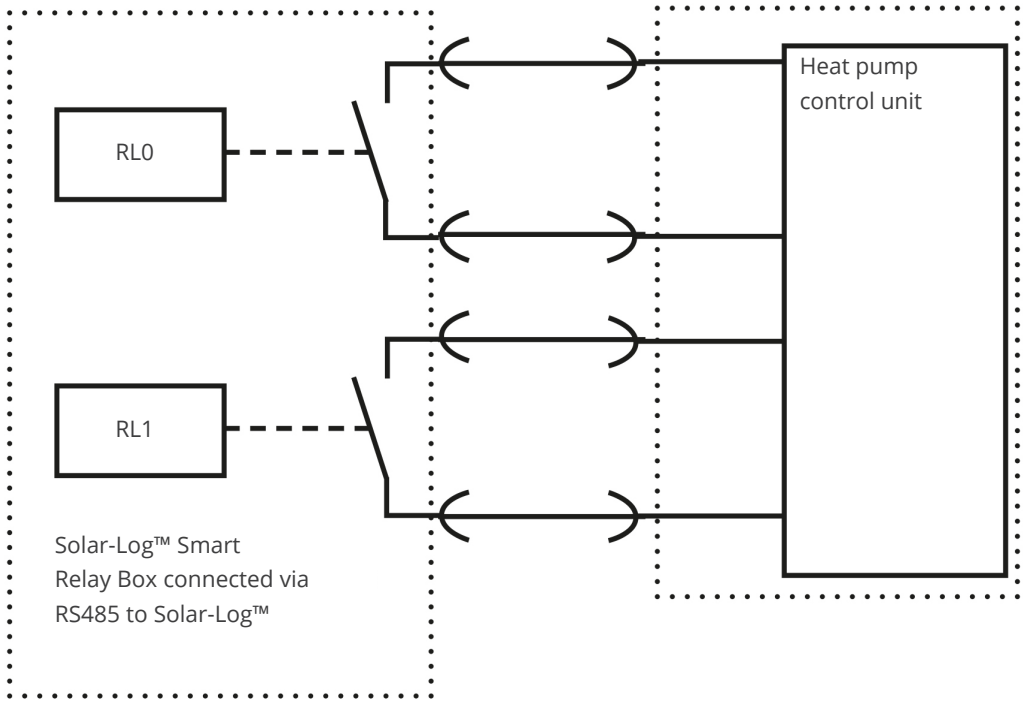


Diagram of the Solar-Log™ and SG-Ready heat pump connection (see circuit diagram in the appendix).

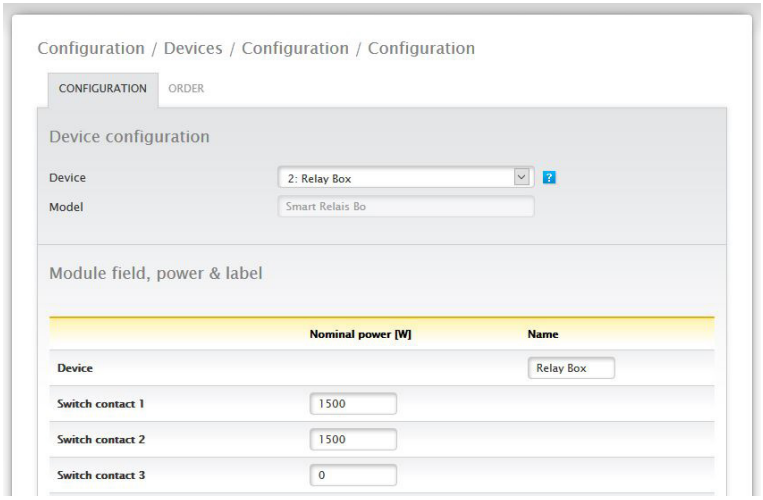


Schematic wiring diagram: Controlling heat pumps via the SG-Ready Signal generated by the Solar-Log™ Smart Relay Box

Configuration Smart Energy devices

The Solar-Log™ Smart Relay Box is used as the switch in this example. Two relays are to be configured from this device.

Configure the switch in the Configuration | Devices | Configuration menu, as in the screenshot.

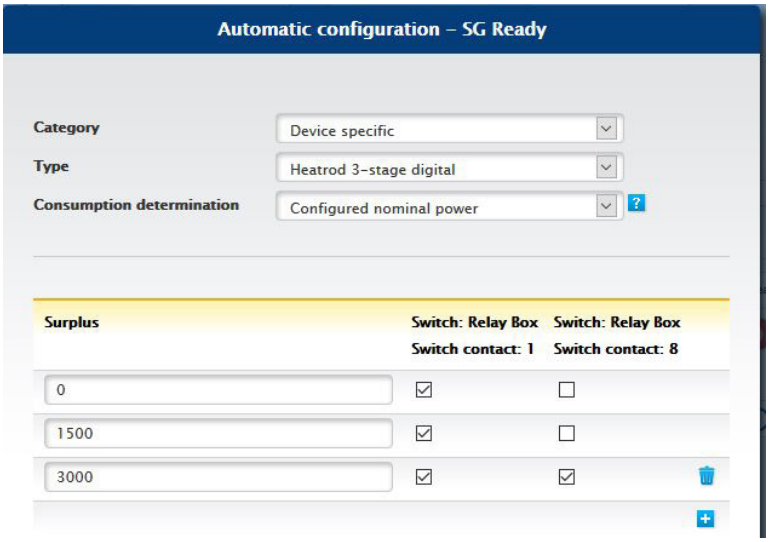


Configuration Solar-Log™ Smart Relay Box

Configuration Smart Energy logic

An exact alignment of the PV plant with the heat pump should take place when configuring Smart Energy logics. The power consumption of the heat pump (compressor) has to be used as the threshold value for the different levels. Since the power consumption of the heat pump differs greatly throughout the year based on the outside temperature, it is recommend to adjust the threshold values by taking this into consideration.

Generally, heat pumps can be controlled with the "Heatrod 3-stage digital" profile under Configuration | Smart Energy | Switching Groups. This profile is particularly well suited for generating bit patterns. It is important to adjust the relay switching to the input definition of the particular heat pump.



Example configuration of the "Heatrod 3-stage digital"

5.4 Ventilation System

A ventilation system is managed in this example. The ventilation system is only activated when enough self-produced power is available.
This example can be applied to any case in which appliances can be controlled via the Solar-Log™ Smart Relay Box and power relays.

Devices used

The ventilation system for this example consists of several ventilators with a total power consumption of 4,500W. These ventilators only have one operating mode (speed) and operate in unison. The Solar-Log™ Smart Relay Box (Adam 4068) and the corresponding load relay (20A) are used as the switch.

Installation

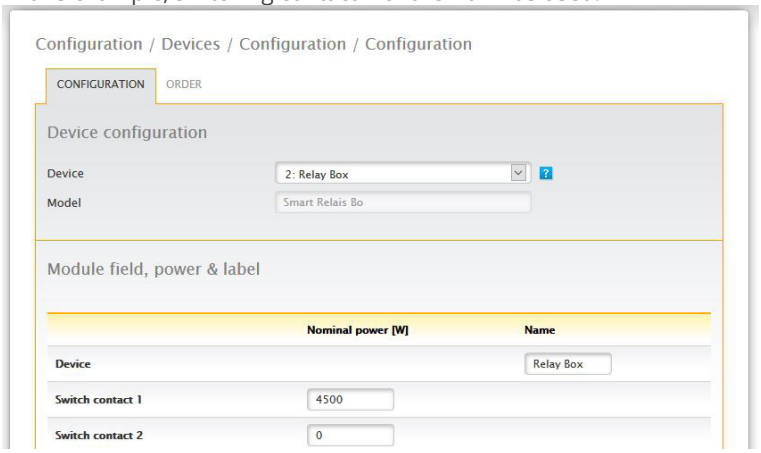
Diagram of the ventilator control (see circuit diagram in the appendix).

Alternative devices

For appliances with an output up to 16A, the Solar-Log™ Smart Relay Station is a good alternative in these applications. Instead of switching the power relay via the Solar-Log™ Smart Relay Box, the Solar-Log™ Smart Relay Station can switch the appliance directly.

Configuration Smart Energy device

Configure the Solar-Log™ Smart Relay Box in the Configuration | Devices | Configuration menu.
In this example, switching contact 1 of the Box was used.

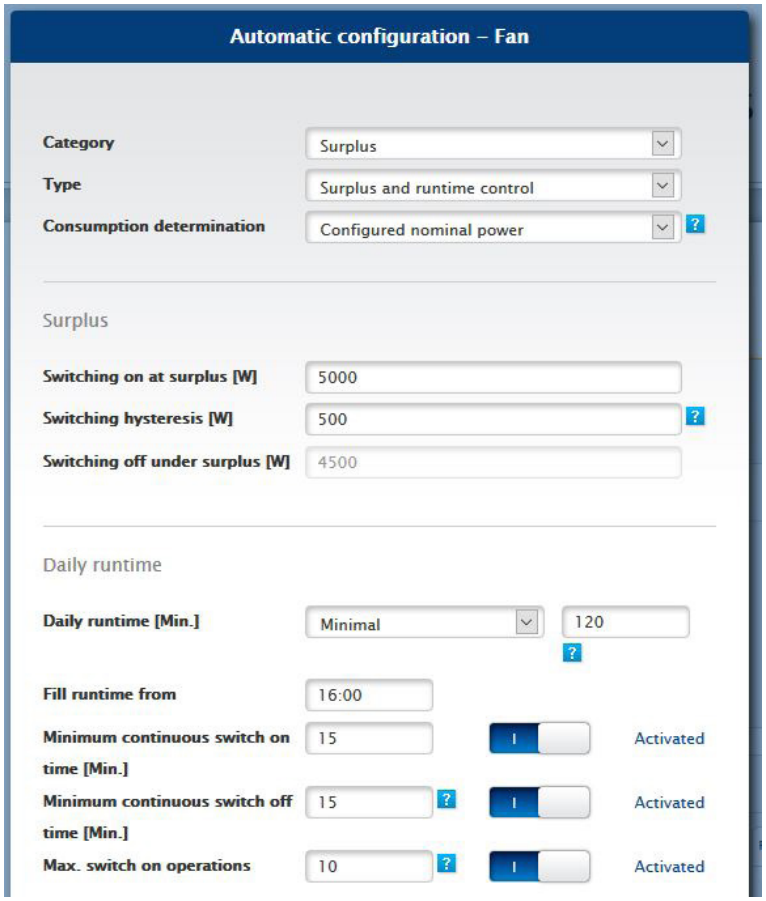


Configuration of the Solar-Log™ Smart Relay Box, using the relay 0

Configuration Smart Energy logic

The profile "Surplus control" is provided under Configuration | Smart Energy | Switching Groups to manage the ventilation system.

Alternately, the profile "Surplus and Time Control" could also be used. This profile ensures that the ventilation system always operates at least for the set operating time, regardless of the amount PV surplus for the day.



Example configuration with the profile "Surplus and Time Control"

Explanation for the example configuration

The logic activates the appliance with the nominal power of 4500W when the amount of surplus reaches 5000W and deactivates it when the surplus falls below 4500 W.
When the switch has been activated, the Solar-Log™ has a counter for the operating time of the switch. When the defined runtime – 120 minutes here – was not reached, the switch is activated at 16:00 and remains active until the total runtime of 120 minutes has been reached.
During surplus operation, the appliance remains turned off according to the "Minimum continuous switch-off time" – 15 minutes here – even if there is already enough surplus power to activate the appliance.
The appliance is turned on according to configured "Max. switch on operations." The remaining daily runtime is completely fulfilled with the last switching run.

5.5 Heating rod three level digital

If a convention heating rod is available, it can be used to heat water with the "Heating rod three level digital" logic.

Devices used

The Solar-Log™ Smart Relay Station is well suited as a load relay for heating rods with up to three heating coils with a maximum output of 3500 W. This is a prime example for all managed appliances with the maximum power of 16A.

Installation

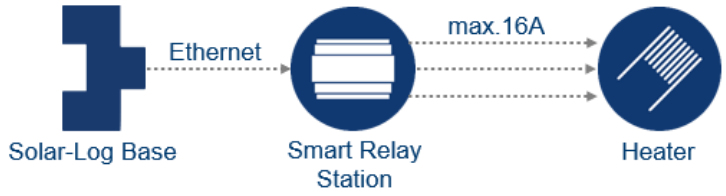
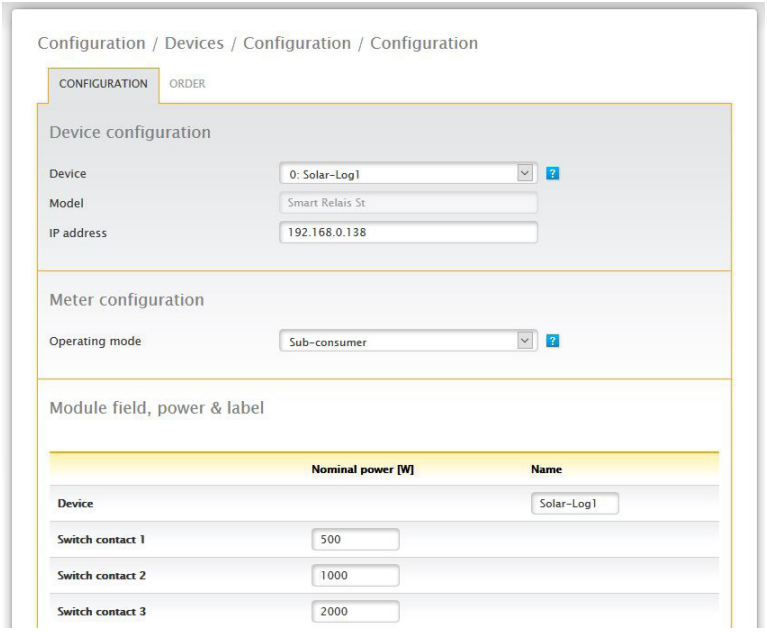


Diagram of the heating rod management (see circuit diagram in the appendix).

Configuration Smart Energy device

Configure the Solar-Log™ Smart Relay Station in the Configuration | Devices | Configuration menu.
All three switching contacts of the Station are used in this example.



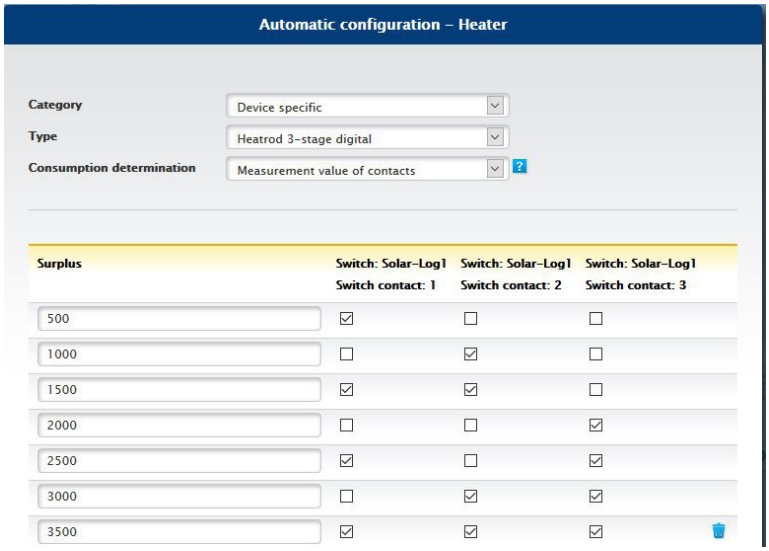
Configuration of the Solar-Log™ Smart Relay Station using contact 1-3

The actual output of the heating rod coil has to be defined for the switching contacts. Our example with three coils uses the following outputs:

- Coil 1 = 500W
- Coil 2 = 1000W
- Coil 3 = 2000W

Configuration Smart Energy logic

There is a special "Heating rod three level digital" logic under Configuration | Smart Energy | Switching Groups- for this specific application.



Example configuration with the profile "Heating rod three level digital"

Explanation for the example configuration

Every combination of the heating coils for surplus consumption can be defined in the matrix. There are 7 surplus levels available that can be managed with a maximum of 3 switching contacts.

6 Smart Consumers

Solar-Log GmbH defines devices as smart (intelligent) consumers when they can be connected to the Solar-Log™ at the protocol level. The Solar-Log™ periodically provides the appliances the data for the calculated amount of surplus power and the appliances themselves determine if they use the surplus.
For example, the AC-ELWA-E would not turn on when there is a large surplus if the buffer storage has reached its upper temperature limit.

6.1 AC-ELWA-E

The AC-ELWA-E is an intelligent appliance for the Solar-Log™.
The power is activated steplessly depending on the current surplus. The Solar-Log™ provides the heater the current surplus data and the heater adjusts its output based on this information. The heating rod reports its current power consumption and stats (standby, heat and heat finished) to the Solar-Log™. This information is then also included in the visualization process.

General information on managing and prioritizing the AC-ELWA-E via smart energy

The Solar-Log™ can manage and prioritize up to six AC-ELWA-E with the smart energy function.
The heating elements are connected via Ethernet.

Example image: AC-ELWA-E for the installation in a buffer storage

6.1.1 Configuration and Connection

The AC-ELWA-E is connected to the Solar-Log™ via Ethernet. An exclusive bus connection is required here – the heating rod cannot be combined with an inverter on a single bus.

Installation

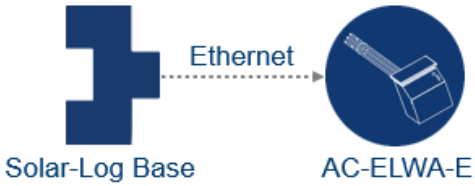
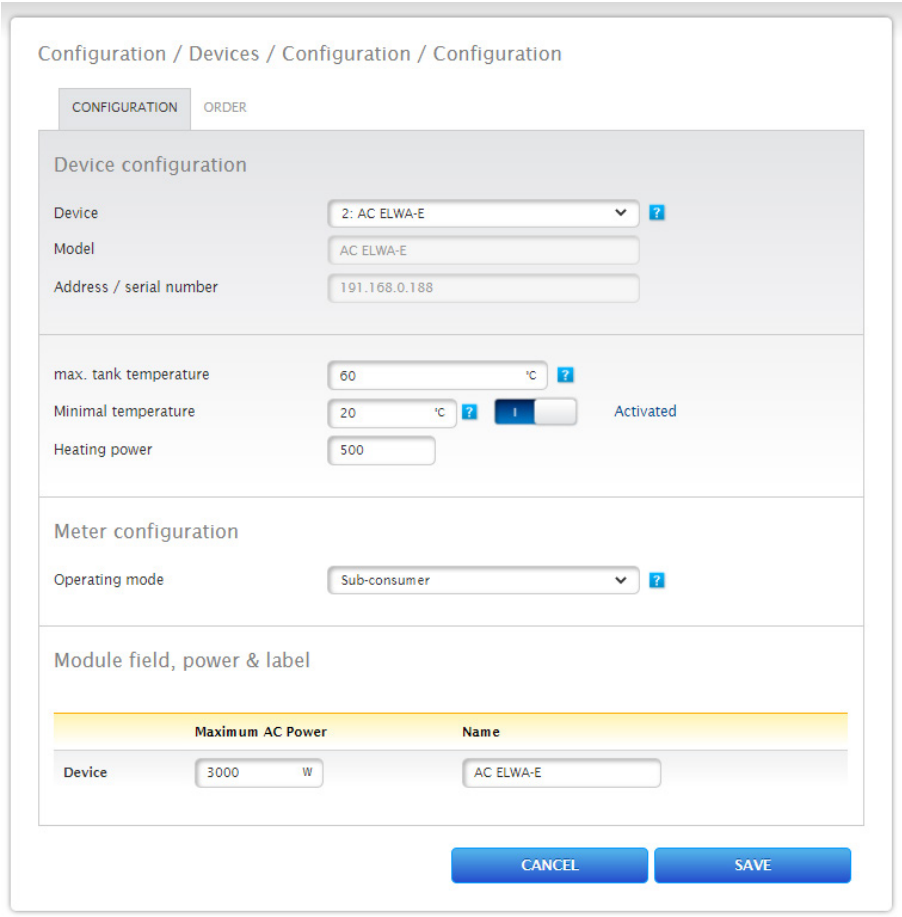


Diagram of the AC-ELWA-E (see circuit diagram in the appendix).

Configuration Device

In the course of the device definition, the AC-ELWA-E must be selected as accordingly. The Solar-Log™ and AC-ELWA-E communicate with each other automatically after detection and exchange the necessary data.



AC-ELWA-E Configuration

The operating mode for the consumption meter of the AC-ELWA-E has to be defined under Configuration | Devices | Configuration:

- Consumption meter
- Sub-consumption meter

Select the "Consumption meter" mode if the consumption of the AC-ELWA-E is not to be recorded via the detected consumption meter. Otherwise, it is considered a sub-consumer.

Here are the additional functions:

- Maximum storage temperature.
  Max. Enter storage temperature in the range from 40°C to 80°C. If 0 is entered, the setting of the SmartHeater potentiometer is used.
- Activate and configure minimum temperature if required. After activating the minimum temperature, the field “Heating power” appears here the heating power of the AC-ELWA-E can be defined. If the temperature falls below this value, the water is automatically heated by 7° C with the configured power. The minimum temperature (must be lower than maximum temperature - otherwise an error will be displayed).
- Select the operating mode under meter configuration. The AC-ELWA-E heating rod can be configured as a consumption meter or sub-consumer.

For additional information, refer to the help texts accessed from the “blue question mark” next to the boxes.

Explanation of the “Heating power” field

In the “Heating power” field, the power value (in watts) is entered with which the heating rod is to bring the minimum temperature back to the specified number of degrees (20 degrees in the example) if this is not reached. Since the power consumption is based on the undershooting of the number of degrees, this can usually only be covered with mains supply.

Information on the maximum storage temperature for the AC-ELWA-E

By default, the maximum boiler temperature is adjusted with the rotary switch on the AC-ELWA-E. To be able to control the temperature from the Solar-Log™, the rotary switch on the AC-ELWA-E has to be set higher than the value from the Solar-Log™ because the settings from the rotary switch determine the maximum temperature for external control

Example:

If the rotary switch is set to 40°C and the Solar-Log™ to 60°C, the settings from the Solar-Log™ will be ignored and the value from the rotary switch will be applied. The range for the rotary switch has to be set higher so that the Solar-Log™ can assume control. In the example to 60°C.

For this reason, we recommend setting the rotary switch to a maximum of 80°C – or the maximum broiler temperature that is not to be exceeded – when the Solar-Log™ is to control the temperature externally.
The Solar-Log™ can control the temperature when it is in the range below the set maximum value.

Note

Since the AC-ELWA-E is considered an intelligent appliance, the point Configuration Smart Energy Deviceis omitted here.

The surplus priority has to be set for the AC-ELWA-E under Configuration | Smart Energy | Surplus Management when there are several appliances to be control based on the amount of surplus.

Note!

Up to 6 heating elements can be controlled and prioritized via the Smart Energy function of the Solar-Log™.

Note

To ensure that the AC-ELWA-E control works properly, the AC-ELWA-E manual temperature regulator should be set to the maximum temperature. Define the temperature that the Solar-Log™ should control via the WEB interface of the Solar-Log™ in the Configuration | Devices | Configuration menu.

Note

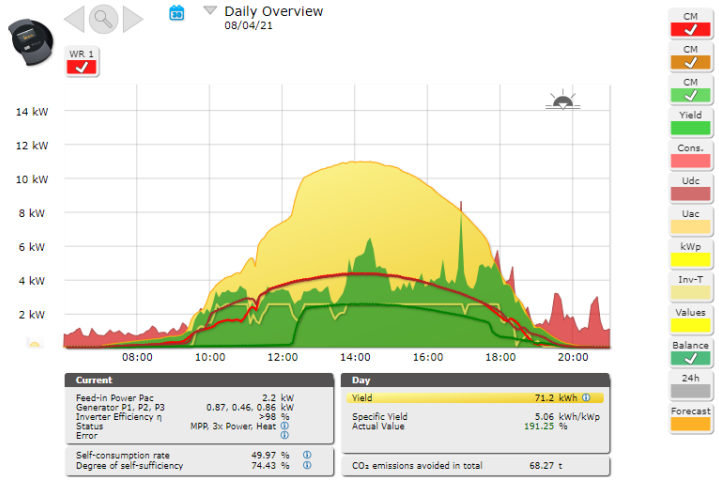
The AC-ELWA-E is an intelligent appliance. The available reported surplus is reported to the smart consumers and can be consumed by them.
The simultaneous connection of several smart consumers is supported.

Note!

Not compatible with the Solar-Log 250 and Gateway Solar-Log 50.

Visualizing the AC-ELWA-E

The heater data can be analyzed in two sections in the Solar-Log Web Enerest™.



Daily overview with the Smart Appliance AC-ELWA-E

The self-consumption (green) is displayed in addition to the production (yellow) in this day curve. The purple indicates just the consumption of the heating rod.

AC ELWA-E (ID: 8) | 08/04/2021 | All Status (3) | All Errors (1) | Clear Selection | Export

Inverter	Date	Status	Error
8	08.04.2021 19:05 - 09.04.2021 08:10	Standby	
8	08.04.2021 18:25 - 08.04.2021 19:05	Heat	
8	08.04.2021 18:20 - 08.04.2021 18:25	Standby	
8	08.04.2021 13:37 - 08.04.2021 18:20	Heat	
8	08.04.2021 13:36 - 08.04.2021 13:37	Heat finished	
8	08.04.2021 13:32 - 08.04.2021 13:35	Heat	
8	08.04.2021 13:31 - 08.04.2021 13:32	Heat finished	
8	08.04.2021 13:29 - 08.04.2021 13:31	Heat	
8	08.04.2021 13:27 - 08.04.2021 13:28	Heat finished	
8	08.04.2021 13:25 - 08.04.2021 13:27	Heat	
8	08.04.2021 13:24 - 08.04.2021 13:25	Heat finished	
8	08.04.2021 13:22 - 08.04.2021 13:24	Heat	
8	08.04.2021 13:20 - 08.04.2021 13:21	Heat finished	
8	08.04.2021 13:18 - 08.04.2021 13:20	Heat	
8	08.04.2021 13:16 - 08.04.2021 13:17	Heat finished	
8	08.04.2021 12:29 - 08.04.2021 13:16	Heat	
8	08.04.2021 12:28 - 08.04.2021 12:29	Heat finished	
8	08.04.2021 12:25 - 08.04.2021 12:27	Heat	
8	08.04.2021 12:24 - 08.04.2021 12:25	Heat finished	
8	08.04.2021 12:22 - 08.04.2021 12:23	Heat	
8	08.04.2021 12:21 - 08.04.2021 12:22	Heat finished	

Example: Listing of the status messages of the heating rod on one day (excerpt)

6.2 IDM Heat Pumps

IDM heat pumps are classified as Solar-Log™ Smart Consumers. When the Solar-Log™ and IDM are located in the same network, they automatically communicate with each other. The Solar-Log™ calculates the amount of surplus (5-minute average or current value depending on the configuration) and provides the heat pump this information. Furthermore, a yield forecast for the current day and the next two days can be provided when the plant is registered in the Solar-Log WEB Enerest™ portal. The heat pump decides itself whether and how the surplus power is used in connection with the yield forecast.. The convenience functions such as the individual preferences for the minimum and maximum temperatures and increases or decreases in temperature are adjusted in the heat pump software (IDM Navigator).

6.2.1 Configuration and Connection

Installation

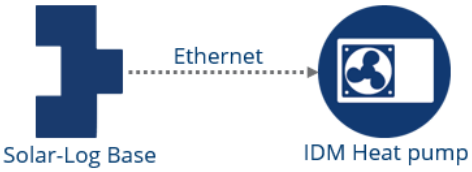
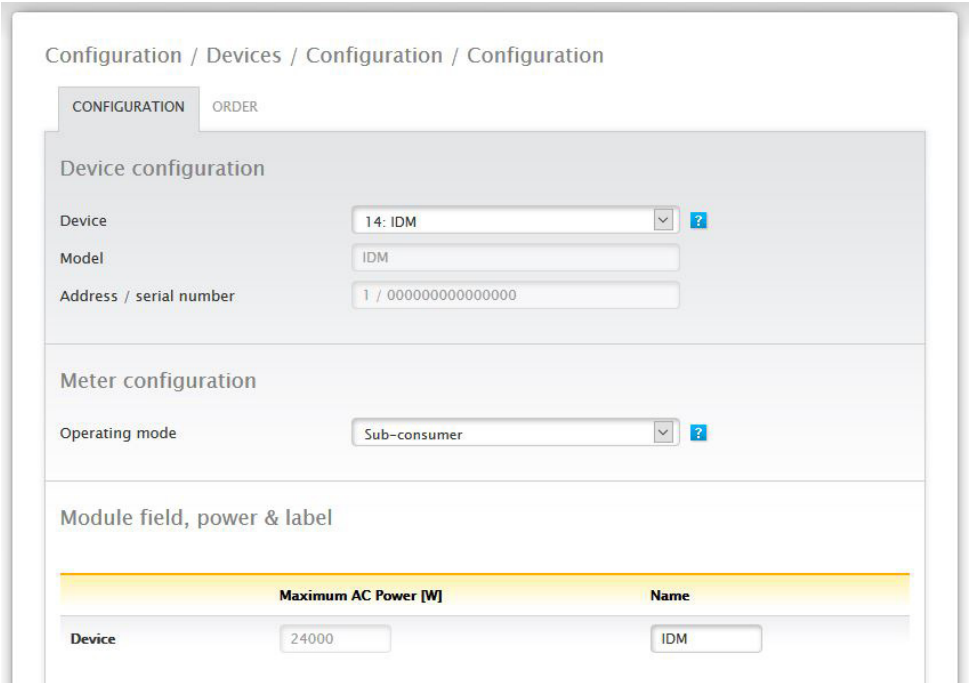


Diagram of the IDM heat pump (see circuit diagram in the appendix).

Configuration Device

The IDM heat pump is to be selected like a network inverter for the device definition. The Solar-Log™ and IDM heat pump communicate with each other automatically after detection and exchange the necessary data.



Configuration IDM Heat Pumps

The operating mode for the consumption meter of the IDM heat pump has to be defined under Configuration | Devices | Configuration:

- Consumption meter
- Sub-consumption meter

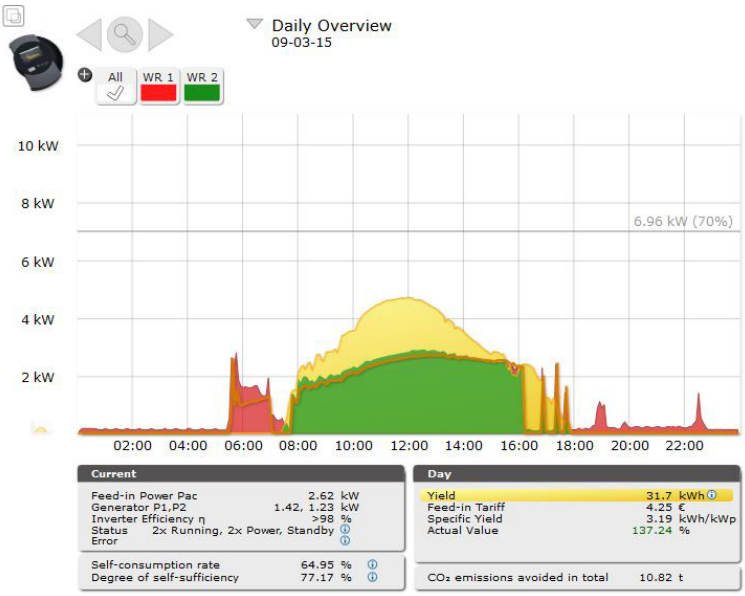
Select the "Consumption meter" mode if the consumption of the IDM heat pump is not to be recorded via the detected consumption meter. Otherwise, it is considered a sub-consumer.

Since the IDM heat pump is considered an intelligent appliance, the point Configuration Smart Energy Deviceis omitted here.

The surplus priority has to be set for the IDM heat pump under Configuration | Smart Energy | Surplus Management when there are several appliances to be control based on the amount of surplus.

6.2.2 Visualization of IDM Heat Pumps

The heat pump data can be analyzed in the overview graphic in the Solar-Log Web Enerest™.



Daily overview with intelligent IDM heat pumps

The self-consumption (green) is displayed in addition to the production (yellow) in this day curve. The orange indicates just the consumption of the heating rod.

Note

Not compatible with the Solar-Log 250 and Gateway Solar-Log 50.

Note

Only one IDM heat pump can be connected and visualized per Solar-Log™.

6.3 Keba power charging station

Keba power charging stations are to be classified as smart consumers of the Solar-Log™.

6.3.1 Configuration and connection

The Keba power charging station is connected via Ethernet and is connected to the Solar-Log™ via switch or router.

Configuration Device

In the course of the device definition, the Keba power charging station must be selected via the device class and manufacturer (intelligent consumer / Keba). After the device detection, Solar-Log™ and the Keba power charging station communicate automatically with each other and exchange corresponding data.

For the consumption meter included in the Keba power charging station, the operating mode must be determined under Configuration | Devices | Configuration:

- Consumption meter
- Sub-consumption meter

If the consumption of the Keba power charging station is not recorded via a detected consumption meter, the mode „consumption meter" must be selected. Otherwise it is considered to be a sub-consumer.

Other functionalities are:

- There are different selection options for the current limiting function in this section:
  - No control – The Solar-Log™ only records the charging data without any control of the charging process.
  - Surplus - The electric car only changes when there is enough PV power available. The Solar-Log™ takes the defined minimum charge level into consideration. In this case, the release of power for the charging station corresponds to the amount of surplus.
  - Surplus / Minimum charge level - This ensures that the car always reaches its minimum charge level even when no PV power is available. When there is an energy surplus, the Solar-Log™ informs the charging station.
  - Always charge - The Solar-Log™ allows the charging station to consume power without any restrictions, regardless of the production or surplus levels.
- Minimum charging power [mA] - The defined minimum charging power value is taken into account.
- Maximum charging power [mA] - The defined maximum charging power value is taken into account.
- Switch-off delay [Min.] (only when used with the current limiting "Surplus Charging") - The switch-off delay option defines when the charging process should be stopped after the previous surplus is no longer available. This options prevents the charging process from being interrupted by short-term fluctuations in the amount of available surplus. The time factor can be defined from 1 to 60.
- Forced charging via wall switch (X1):
  - Activated
  - Deactivated

Note about forced charging via wall switch (X1)

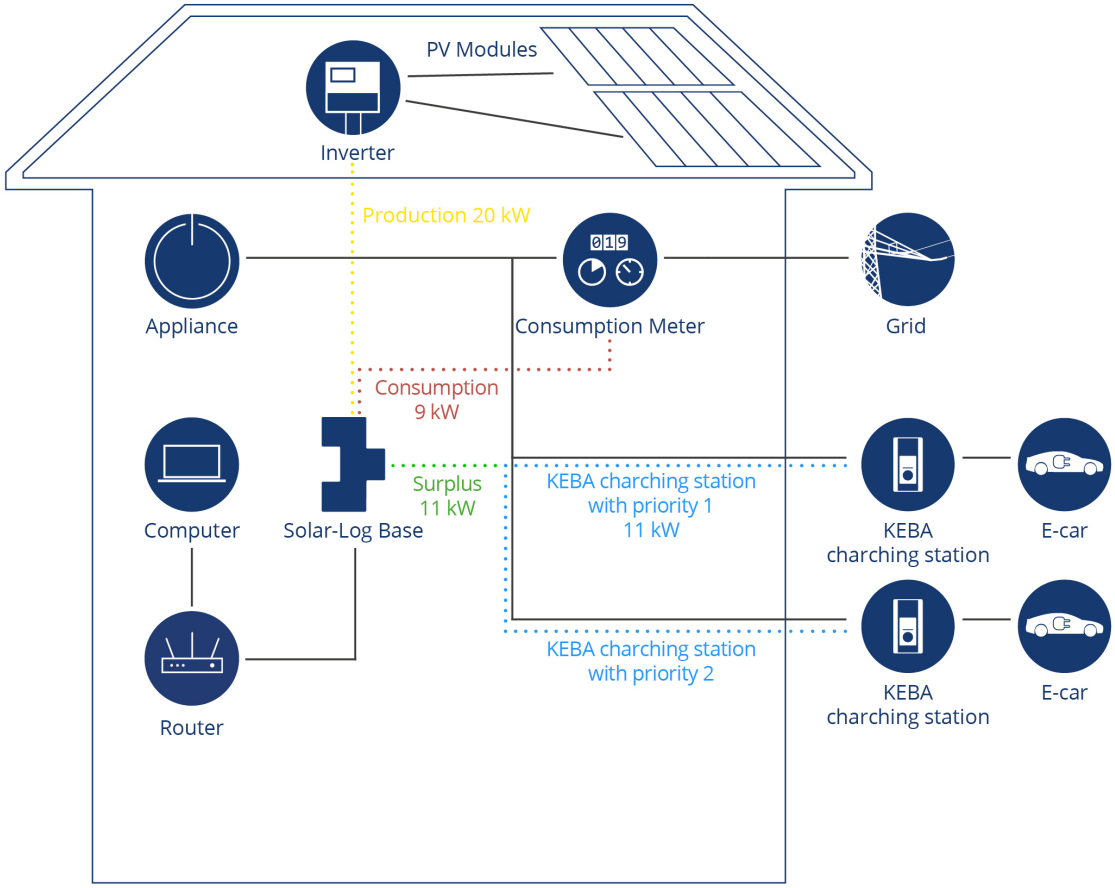
If a wall switch is installed and connected to X1 on the charging station, the charging station is allowed via the Solar-Log™ to consume the defined maximum power levels without any restrictions, regardless of the production or surplus levels.

If a wall switch has not been installed, the Solar-Log™ configuration defined for the current limiting function can be set to “always charge.” This also allows for charging according to the defined maximum power level.

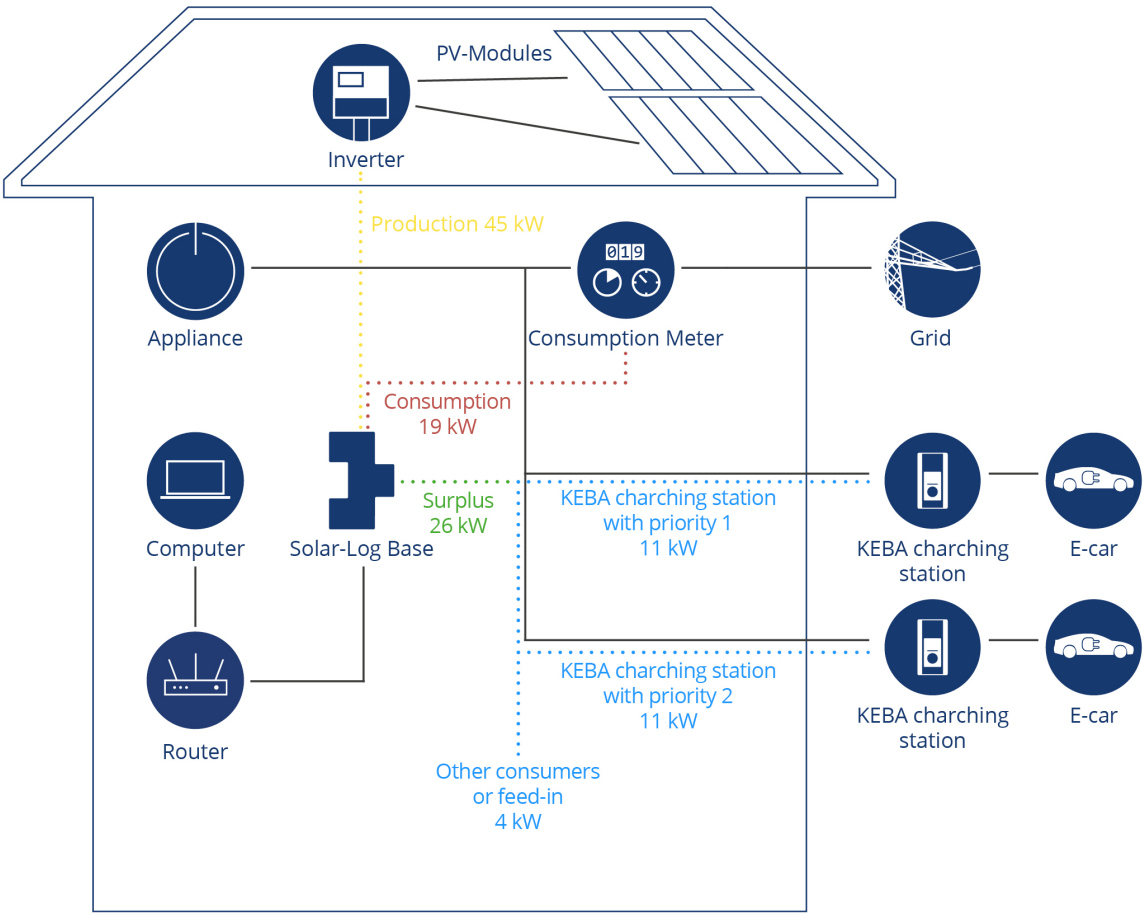
Since the Keba power charging station is an intelligent consumer, the item Configuration Smart Energy Device is not used here.

But in case of several consumers that are controlled with surplus, the surplus priority for the Keba power charging station must be set under Configuration | Smart Energy | Surplus Management.

Two examples of KEBA control



The available surplus of 11kW is first used for the charging station with priority 1. If the surplus charge used by the charging station with priority 1 is reduced or is not used anymore, then the available surplus will be used for charging the charging station with priority 2.



Both charging stations are supplied with 11kW power each. The remaining 4kW surplus is either used for another configured consumer or for feeding into the grid.

Note KEBA charging station and Smart Energy

The Smart Energy function can be used to control a KEBA charging station and to prioritize up to 6 KEBA charging stations.

Note

Not compatible with the Solar-Log 250 and Gateway Solar-Log 50.

7 Connecting to other Energy Management Systems

The Solar-Log™ offers two software interfaces for the connection with other systems. These interfaces allow specific values to be imported from the Solar-Log™.

7.1 Modbus TCP Interface

Every Solar-Log™ with the latest firmware version offers the option to export values via Modbus TCP. The following values are available:

- P_{AC} (current output)
- P_{DC}
- U_{AC} and U_{DC}
- Yield (Day, Month, Year, Total)
- P_{AC} current consumption
- Consumption (Yield (Day, Month, Year, Total)

To export these values, the corresponding Modbus registers have to be set up for the device.

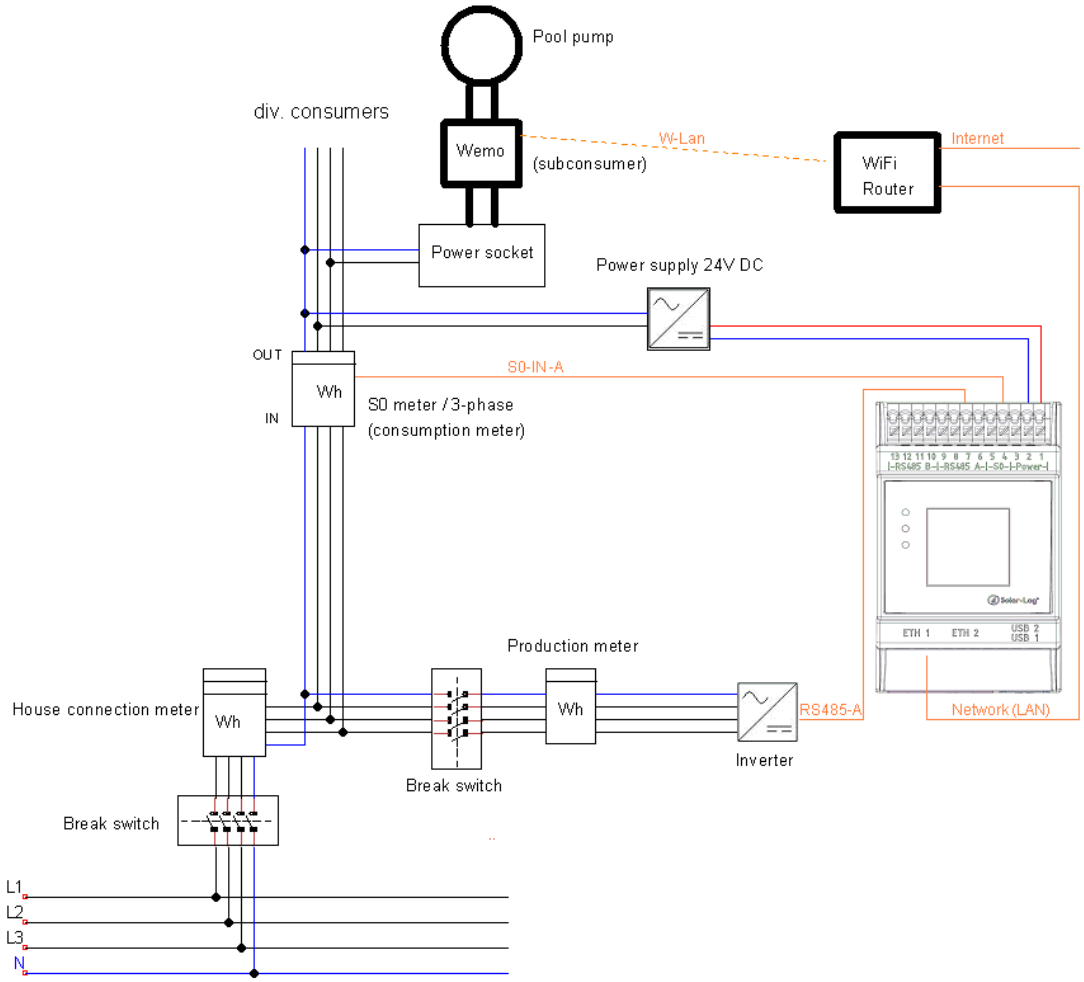
7.2 JSON

The JavaScript Object Notation (JSON) is a compact data format to transmit data between applications. The values mentioned above can be exported in this way. For more detailed information, please refer to the appendix in one of the Solar-Log manuals listed below.
Solar-Log Base Manual 6.x
Solar-Log Base Manual 5.x
Solar-Log Manual 4.2.7

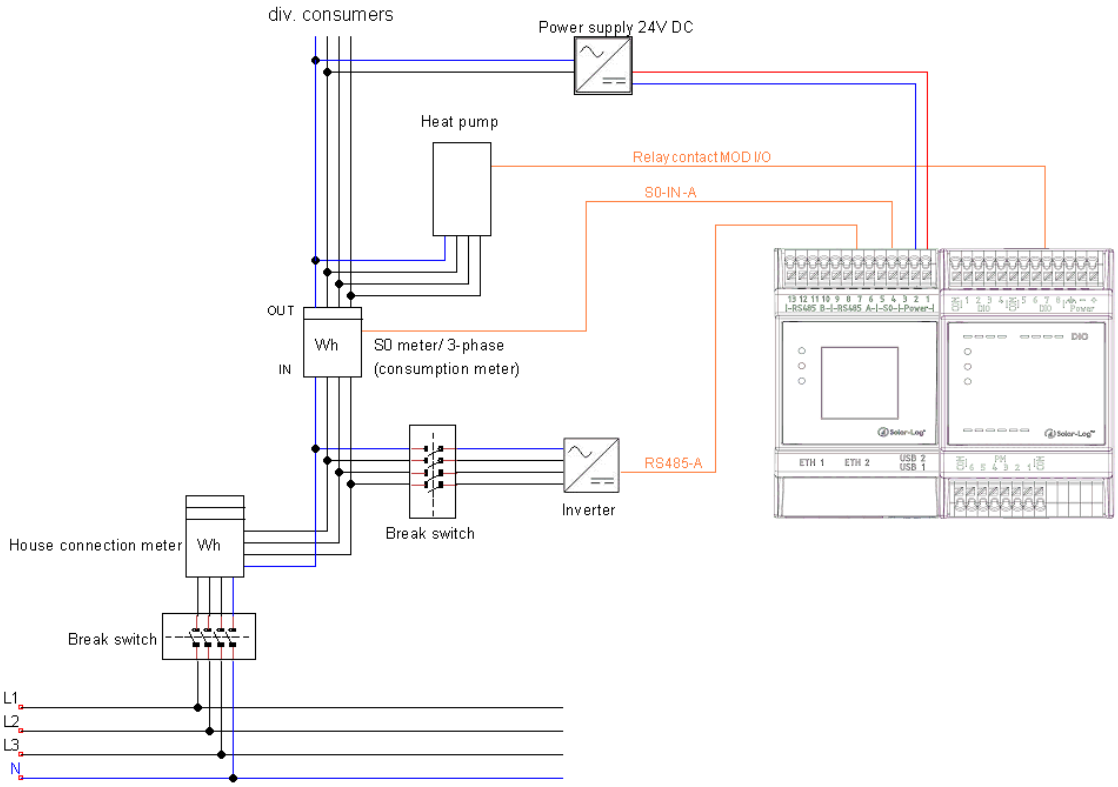
8 Appendix

8.1 Example of wiring diagrams

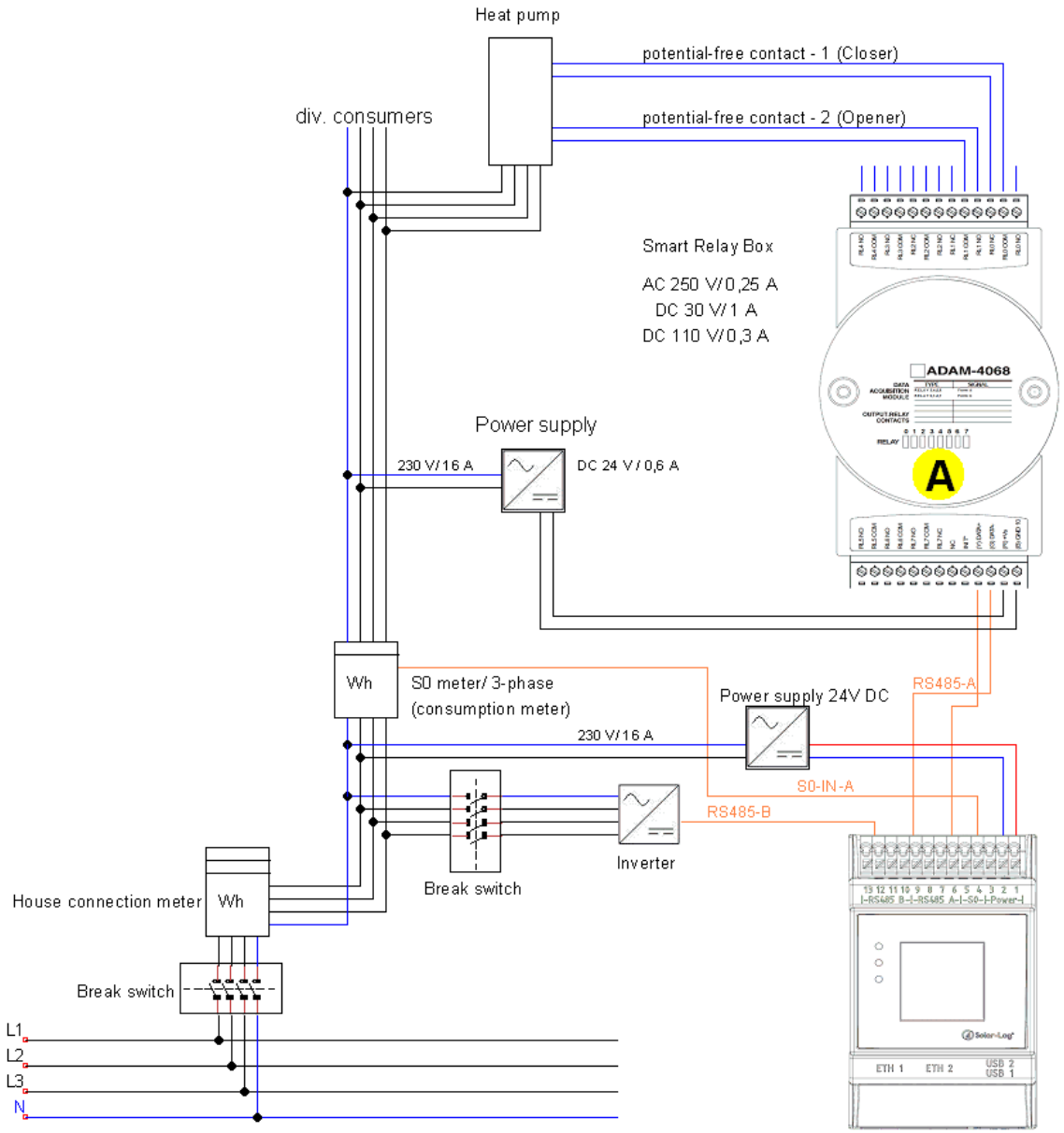
8.1.1 Pool pump with a smart plug



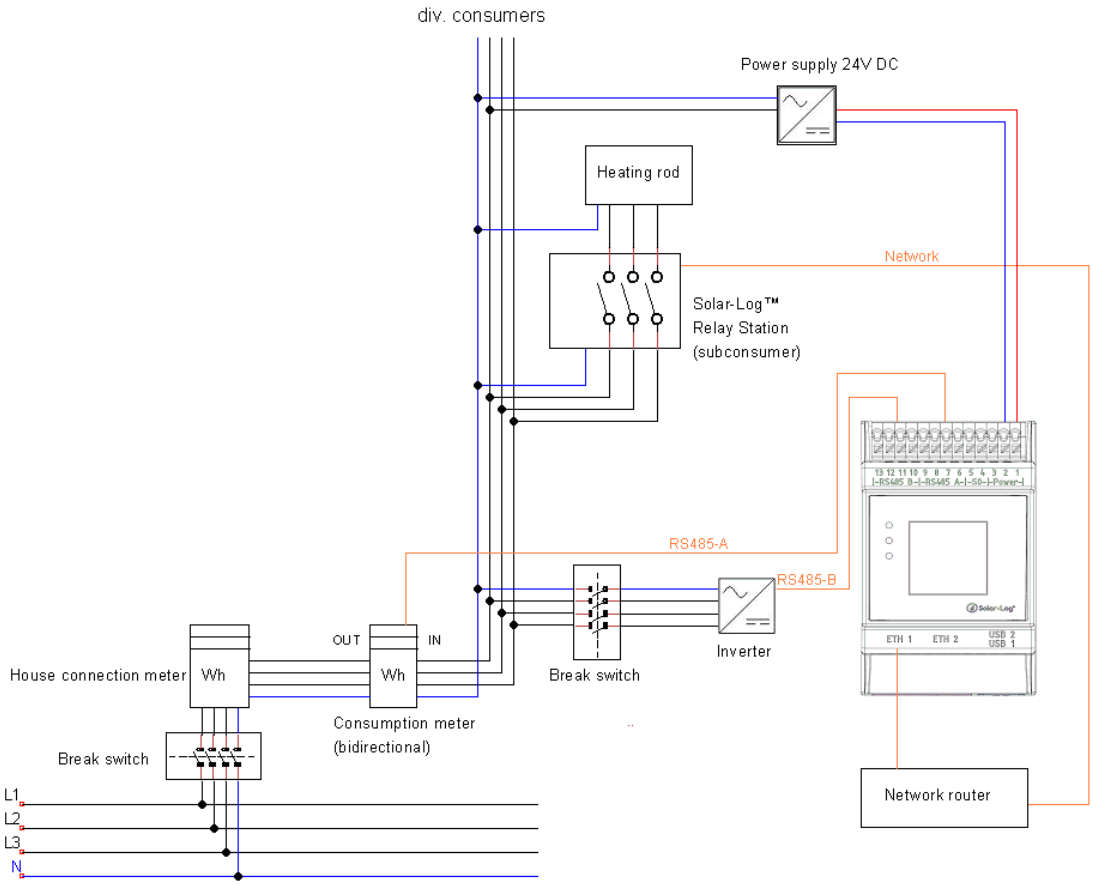
8.1.2 Heat pump via a grid company blocking signal Solar-Log™ relay



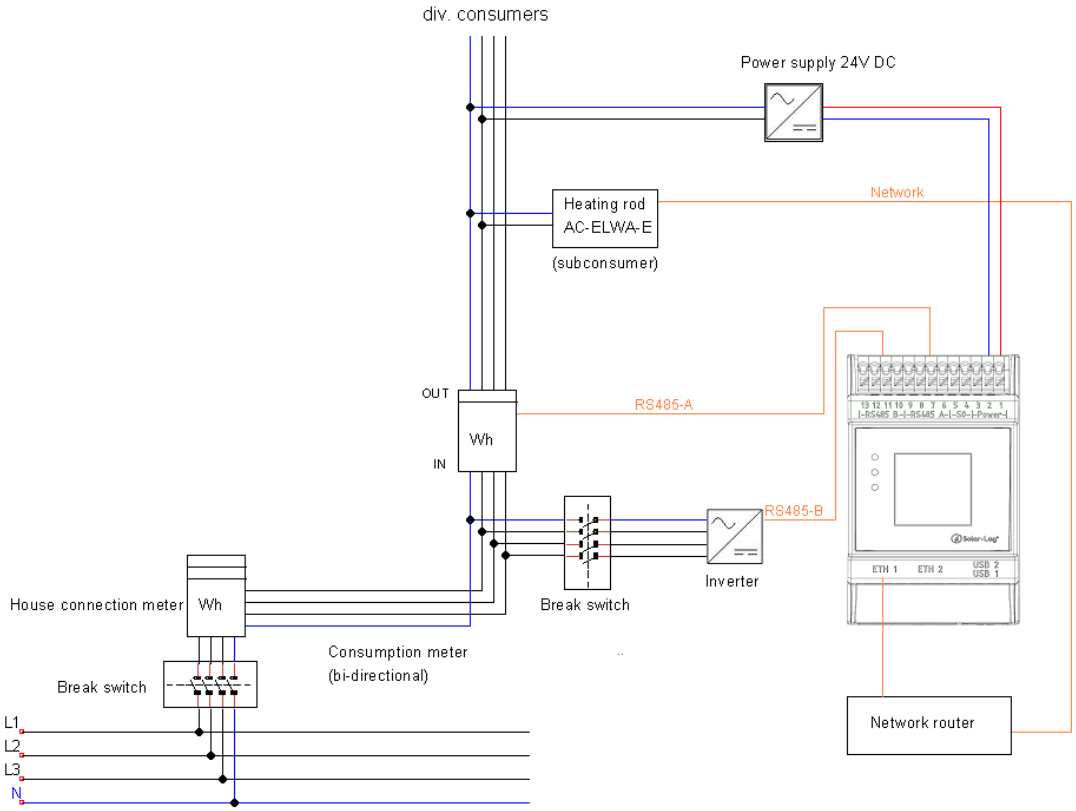
8.1.3 Heat pump via SG-Ready with Smart Relay Box



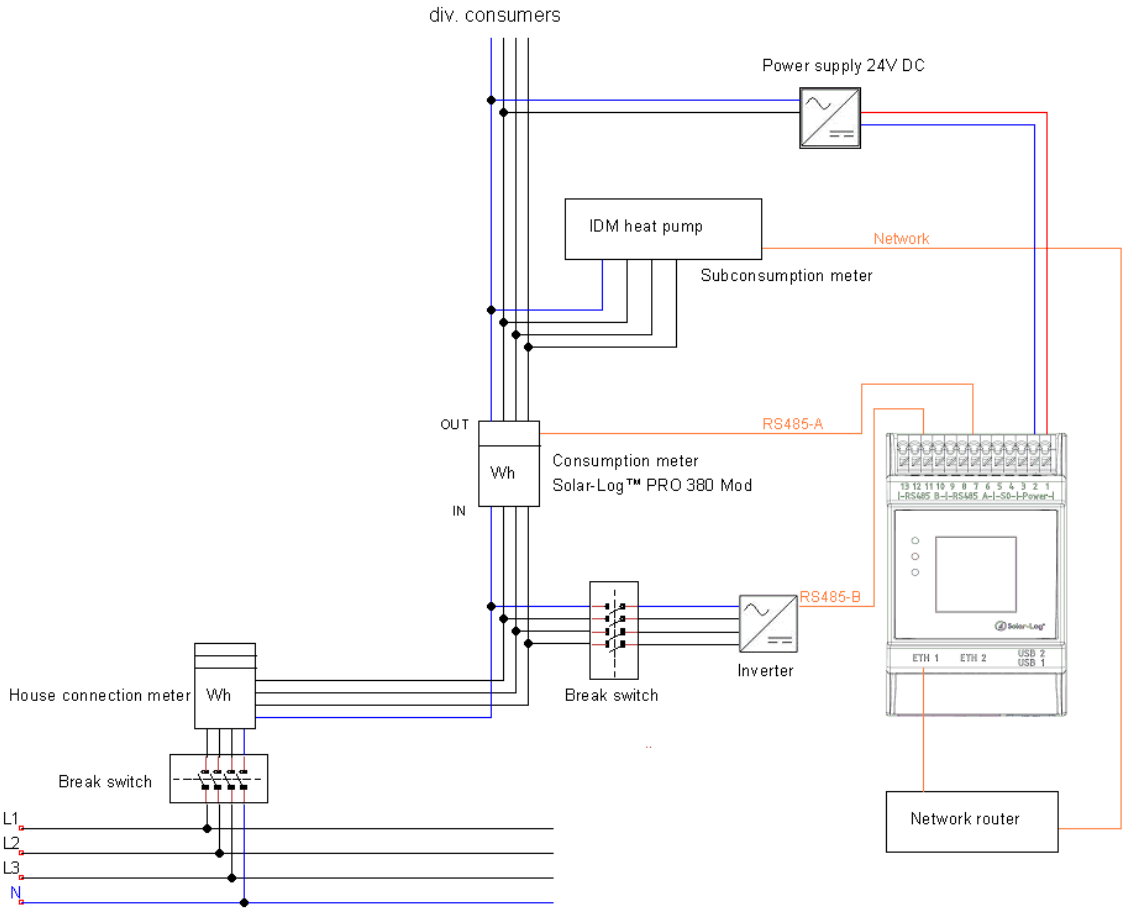
8.1.4 Heating rod three level digital



8.1.5 AC-ELWA-E


div. consumers
Power supply 24V DC
Heating rod
AC-ELWA-E
(subconsumer)
Network
OUT
Wh
IN
RS485-A
RS485-B
Inverter
House connection meter
Wh
Break switch
Consumption meter
(bi-directional)
Break switch
L1
L2
L3
N
Network router

8.1.6 IDM Heat Pumps



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