SOLAR ELECTRIC

KOSTAL

Smart connections.

Operating Instructions

Planning tool KOSTAL Solar Plan for KOSTAL solar inverter

Legal notice

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KOSTAL Solar Electric GmbH is aware of the importance of language with regard to the equality of women and men and always makes an effort to reflect this in the documentation. Nevertheless, for the sake of readability we are unable to use non-gender-specific terms throughout and use the masculine form instead.

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valid from version 2.1.xxx

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Thank you for choosing a product from KOSTAL Solar Electric GmbH!

If you have any technical questions, please call our service hotline or send an e-mail to service-solar@kostal.com.

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[1] Language: German, English

[2] Language: Spanish, English

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1.1 Proper use

The KOSTAL Solar Plan software from KOSTAL Solar Electric GmbH is a free inverter layout software.

It can be used both to automatically establish the most efficient PV systems for a specific site by means of complex yield simulation and to quickly check specified wirings regardless of location.

The resulting yield calculations are determined on the basis of historical weather data and may deviate from the actual yields.

Please always be sure to use the most recent version of the software.

Inappropriate planning can be hazardous and lead to injury or even death to the user or third parties.

Material damage to the device and other equipment can also occur.

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Exclusion of liability

The software may only be used for its intended purpose. Any use that differs from or goes beyond the stated intended purpose is considered inappropriate. The manufacturer accepts no liability for any damage resulting from this.

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Any instance of misuse of the KOSTAL Solar Plan user software will result in termination of the warranty, guarantee and general liability of the manufacturer.

KOSTAL Solar Electric GmbH assumes no liability for damages arising from the non-observance of this manual.

KOSTAL Solar Electric GmbH points out that installing and using the software and the update function are at the user's own risk. KOSTAL Solar Electric GmbH disclaims all liability or warranty within the scope permitted by law.

KOSTAL Solar Electric GmbH does not assume any quality guarantee of performance data specifications or other descriptions of the software, even if they refer to DIN standards and/or other standards.

KOSTAL Solar Electric GmbH assumes no guarantee that the software products will work with third-party software programs or will not infringe on their rights.

IMPORTANT INFORMATION

Only trained and qualified staff are permitted to perform the planning.

The qualified staff is responsible for ensuring that the applicable standards and regulations are observed and implemented. Work that could affect the electrical power system of the respective energy supply company at the site of the solar energy feed-in may only be carried out by qualified electricians expressly authorised (licensed) by the energy supply company.

This includes changes to the factory preset parameters of the inverter.

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The exclusion of liability of KOSTAL Solar Electric GmbH applies particularly to data loss or hardware malfunctions caused by incompatibility of components on the user's PC system with the new or modified hardware and software, and to system failures that can occur due to existing misconfigurations or older, interfering drivers that have not been completely uninstalled.

KOSTAL Solar Electric GmbH also assumes no liability for damages that occur in connection with the operation of the planned photovoltaic system. The software planning results do not replace the user's own test of the system configuration.

KOSTAL Solar Electric GmbH also assumes no liability for damages or financial deviations to layouts that occur in connection with the operation of the planned photovoltaic system. The software planning results do not replace the user's own test of the system configuration.

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1.2 About this manual

Read this manual carefully in its entirety. It contains important information on the installation and operation of the KOSTAL Solar Plan layout tool.

This manual applies to software version 2.1.x and higher.

This manual is part of the software and applies exclusively to the KOSTAL Solar Plan layout tool from KOSTAL Solar Electric GmbH.

The instructions for the KOSTAL Solar Plan layout tool are designed as a step-by-step instruction set.

We recommend you print these instructions out and carry out the inverter layout step-by-step with the printout in your hand.

Most of the user guidelines are self-explanatory. On each layout page you will find help texts and notes near the bottom.

Target group

This manual is intended for installers who plan, install and commission PV systems. Technical expertise is required to use KOSTAL Solar Plan.

TIP

Print both sides on one sheet of paper when printing out this operating manual.

This saves paper and the document remains easy to read.

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Navigation through the document

In order to enable navigation through this document, it contains clickable areas.

These are, for one, the navigation bar in the header of each page. Here you can go to the overview pages of the individual chapters with a click.

The table of contents can also be used in this way. From the index at the beginning of each chapter you can go to the indicated sub-chapter with a click.

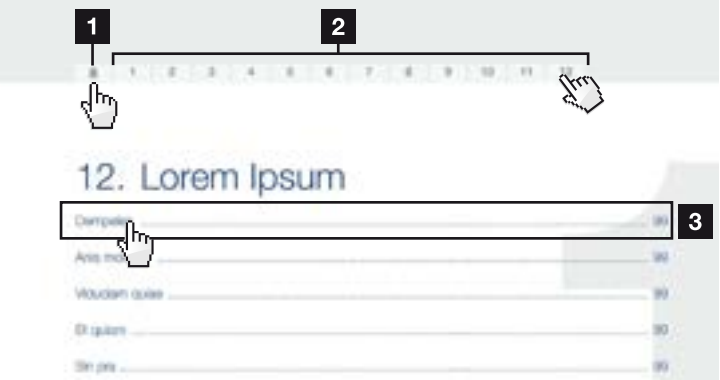

Fig. 1: Navigation through the document

1 Calling up the main table of contents
2 Navigation bar
3 Tables of contents

You can navigate to the referenced points in the document within the instruction text using the cross-references.

Ch. 1

Ch. 1, lt. 2

Fig. 2: Examples of cross-references

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1.3 Notes in this manual

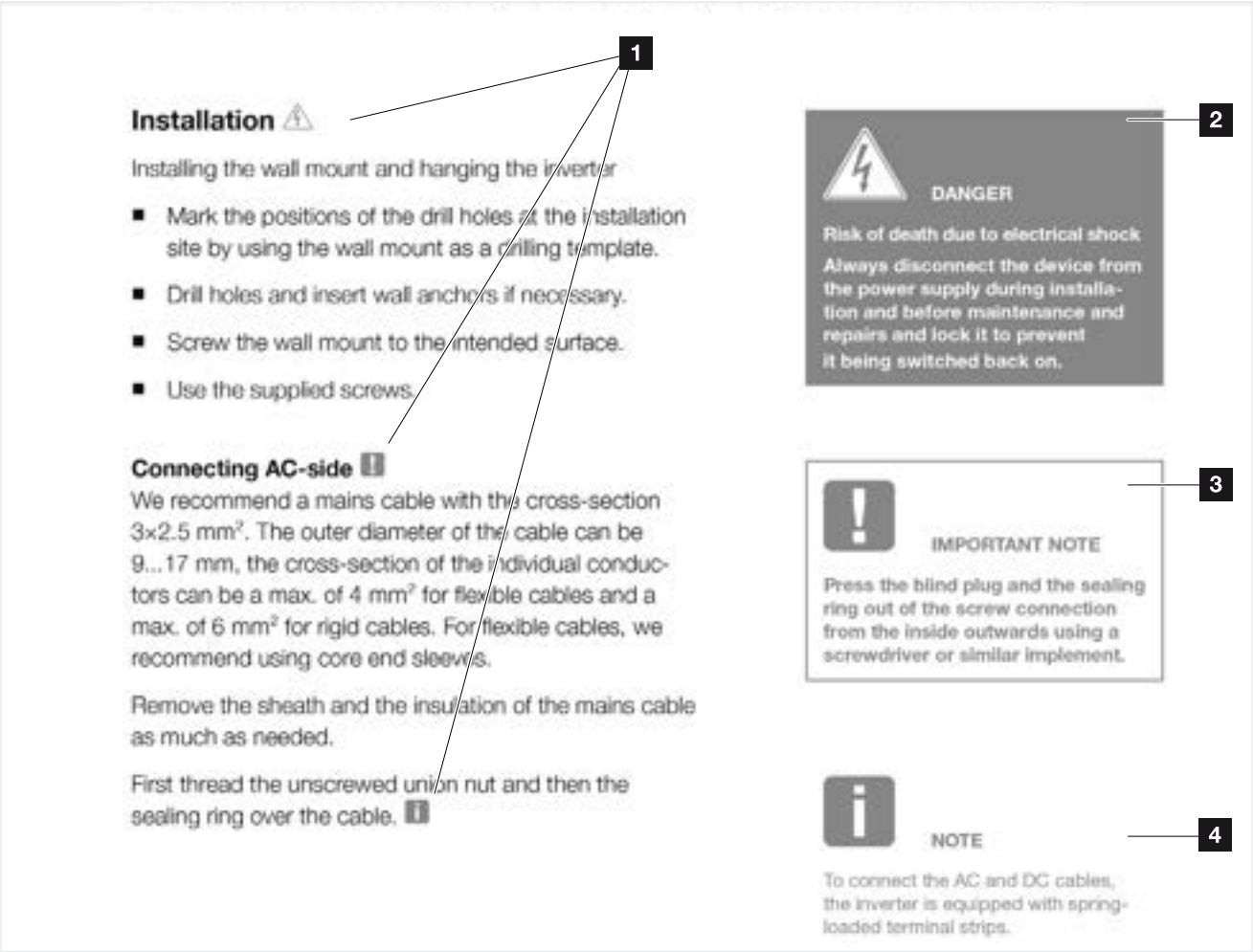

Fig. 3: Safety instructions in this manual

1 Reference icon within the instruction text
2 Warning
3 Information note
4 Other Notes

Notes have been incorporated into the instruction text. A differentiation is made in these instructions between warnings and information notes. All notes are identified in the text line with an icon.

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Warnings

The warnings refer to life-threatening dangers. Serious injuries possibly resulting in death may occur.

Each warning consists of the following elements:

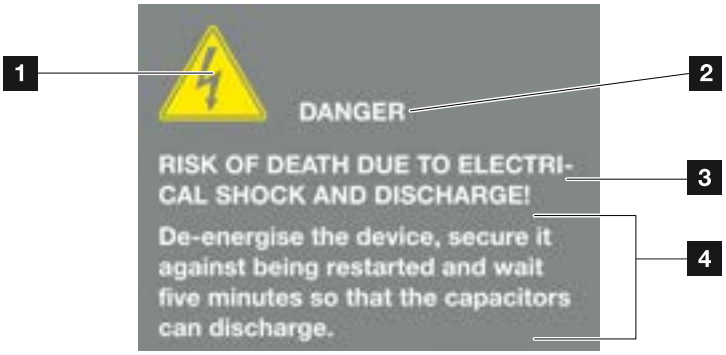

Fig. 4: Structure of the warnings

1. Warning symbol
2. Signal word
3. Type of danger
4. Corrective actions

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Warning symbols

Danger

Danger due to electrical shock and discharge

Signal words

Signal words are used to identify the severity of the danger.

DANGER
Indicates a direct hazard with a high level of risk, which, when it is not avoided, can result in death or serious injury.

WARNING
Indicates a hazard with a moderate level of risk, which, when it is not avoided, can result in death or serious injury.

CAUTION
Indicates a hazard with a low level of risk, which, when it is not avoided, can result in minor or slight injury or property damage.

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Information notes

Information notes contain important instructions for the installation and problem-free operation of the inverter. These must be followed at all times. The information notes also point out that failure to observe can result in property or financial damages.

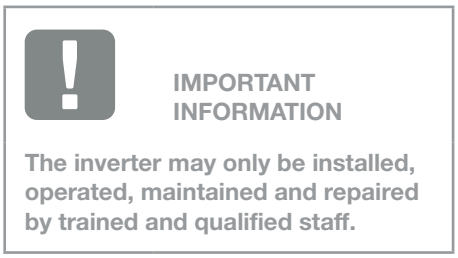

Fig. 5: Example of an information note

Symbols within the information notes

Important information

Property damage possible

Other notes

They contain additional information or tips.

Fig. 6: Example of an information note

Symbols within the additional notes

Information or tip

Enlarged representation

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1.4 Symbols used

Symbol	Meaning
1), 2), 3) ...	Sequential steps in a handling instruction
→	Effect of a handling instruction
✓	Final result of a handling instruction
	Cross-reference to other places in the document or to other documents
■	List

Tab. 1: Symbols and icons used

Abbreviations used

Abbreviation	Explanation
Tab.	Table
Fig.	Figure
It.	Item
Ch.	Chapter

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2.1 About KOSTAL Solar Plan

If a solar system is being planned, not only should the system work, it should produce as high a yield as possible. Without software support, such optimum planning is usually very time-consuming. KOSTAL Solar Electric GmbH therefore provides the free inverter layout tool KOSTAL Solar Plan for its KOSTAL solar inverters.

In line with its "Smart connections." philosophy, KOSTAL Solar Electric GmbH aims to simplify the work of planners and help them find the optimum KOSTAL solar inverter for every PV system.

The layout is based on the technically feasible limits, which are determined individually for each combination of module and inverter type.

Based on the user's specifications, the software determines the best combinations of several different wirings of PV modules, each with one inverter. It calculates the system's specific annual yield in kWh / kWp and various other parameters such as remuneration, savings on electricity costs or degree of self-sufficiency.

The software contains extensive databases of irradiation and temperature data from around 90 000 locations around the world and technical data from 30 000 mainly monocrystalline and polycrystalline PV modules, which are updated regularly. The user's own modules can also be created. 14 consumption profiles are also stored for self-consumption simulation.

INFO

The degree of self-sufficiency states the percentage of the annual power requirement that can be covered by self-generated power. The self-consumption proportion shows the proportion of power you use yourself in relation to the total power generated.

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2.2 The installation

The KOSTAL Solar Plan planning tool must be installed on a PC with the Windows operating system.

Download the software from the homepage of KOSTAL Solar Electric (**www.kostal-solar-electric.de**) under **Download** and install on your Windows system.

Please note the limitations of liability relating to usage and layout when installing.

INFO

The following systems are supported:
Windows 10

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2.3 The user interface

Fig. 7: Start screen

1. With the menu bar you can make use of the corresponding control functions or update the program.
2. You can select the language you want from the language bar.
3. Inverter layout
   This selection undertakes complete planning of the inverter with selected PV modules and wiring.
4. Rapid inverter layout
   Here the inverter and PV modules to be used are planned on just one page.
5. Storage layout
   This selection undertakes complete planning of the inverter with additional storage system.
6. Selection of the inverter groups to be considered in the planning.

INFO

Um so mehr Gruppen hier ausgewählt werden, um so länger dauert die Berechnung

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2.4 The menu bar

Menu	Menu item	Description
File	New project	Create new project
	Open project	Load saved project
	Save	Save current project. If this has not yet been saved, it will be saved under a new project designation
	Save as	Save current project under a new project designation
	Print preview	Print preview of the current project
	Print	Print the current project
	Finish	End program

Tab. 2: Menu item: File

Menu	Menu item	Description
Extra	PV modules	Opens the module database, in which favourites can be selected or to which own modules can be added
	User data	Entry of the user data (installer data)
	Program options	Entry of proxy and general settings for updates/currency, module variance and displaying tooltips as aids
	Internet update	Update the database (e.g. for inverter, PV module, etc.)

Tab. 3: Menu item: Extra

Menu	Menu item	Description
Help	Terms of use	Terms of use for KOSTAL Solar Plan
	Manual	Opens these operating instructions
	Info	Locations/contact details for the companies and info about the KOSTAL Solar Plan version

Tab. 4: Menu item: Help

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2.5 The buttons

The buttons on the program pages can be used to navigate around the program or perform particular actions. The buttons change from grey to blue as soon as they are activated.

Button	Explanation
	Go to start screen
	Create new project
	Save project
	Print project
	Go to next page in project
	Go to previous page in project

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2.6 Entry of the user data

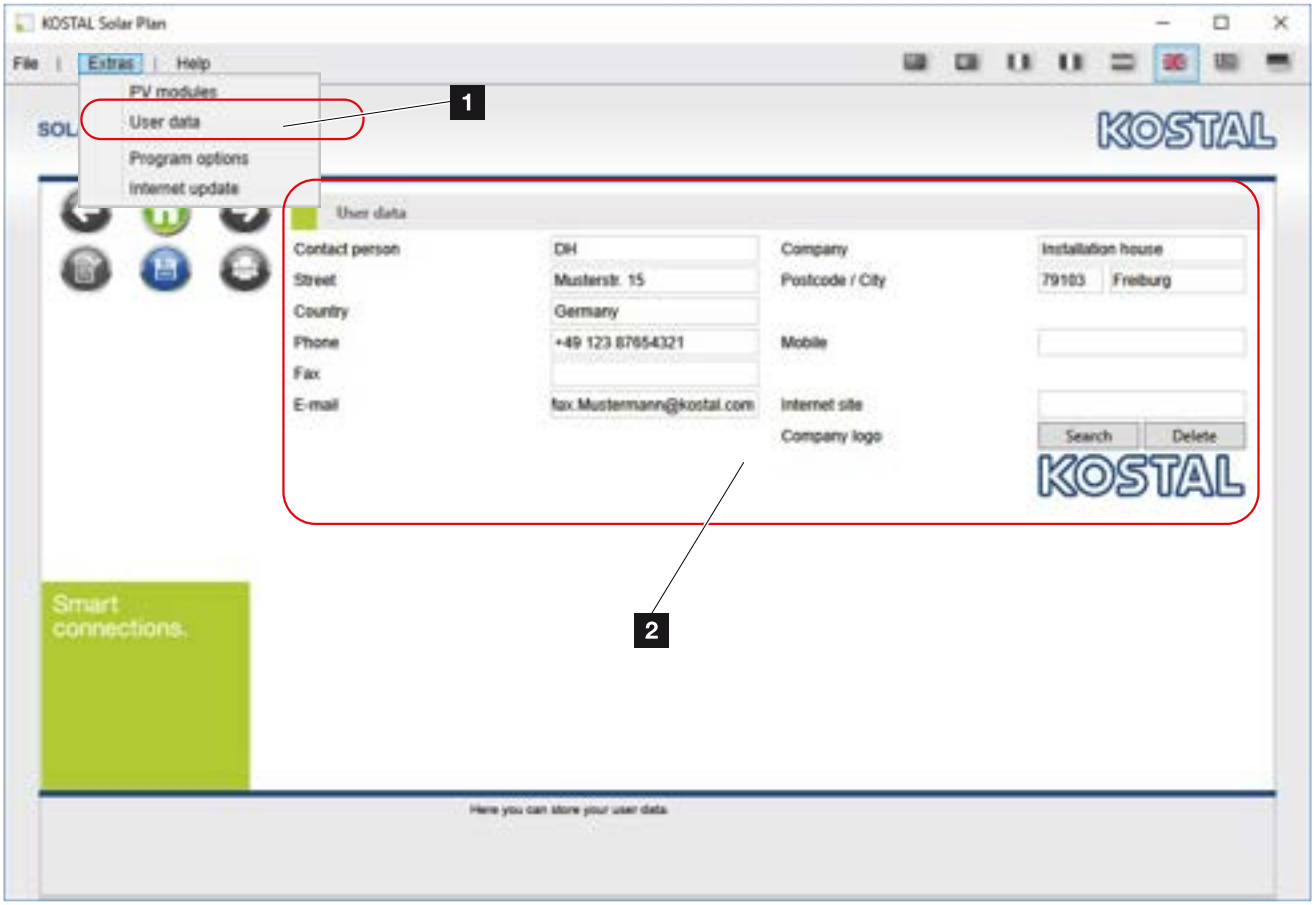

Fig. 8: User data

Under "Extras" > "User data", all necessary information concerning your company that is subsequently to appear in the offer can be entered.

Choose the "Search" function to insert a company logo.

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2.7 The PV module database

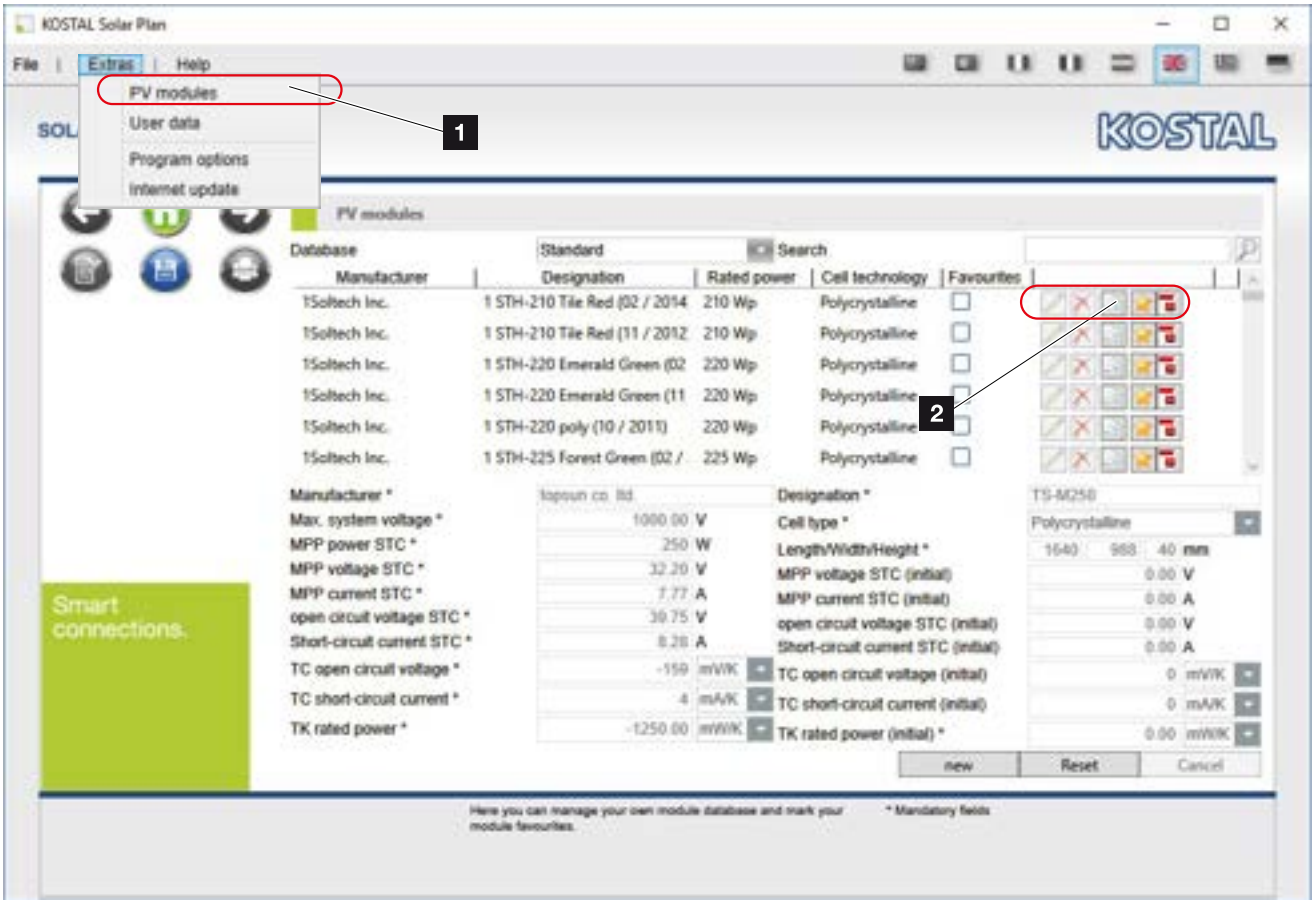

Fig. 9: PV module database

Own modules can be entered by going to "Extras" > "PV modules" or limited to certain favourites in the database. To do so, choose the star next to a module type, which then adds all modules of a manufacturer to your favourites.

To edit modules you have produced yourself or copied (using the copy button next to the modules), please select the pencil.

To remove these modules from your database, use the corresponding button with a red cross on it. Please note that only modules that you have produced yourself or copied can be deleted.

Clicking on the PDF icon takes you to the online data sheet version of the modules.

INFO

The database contains technical data for around 30 000 mainly monocrystalline and polycrystalline PV modules, which is updated regularly.

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2.8 Program options

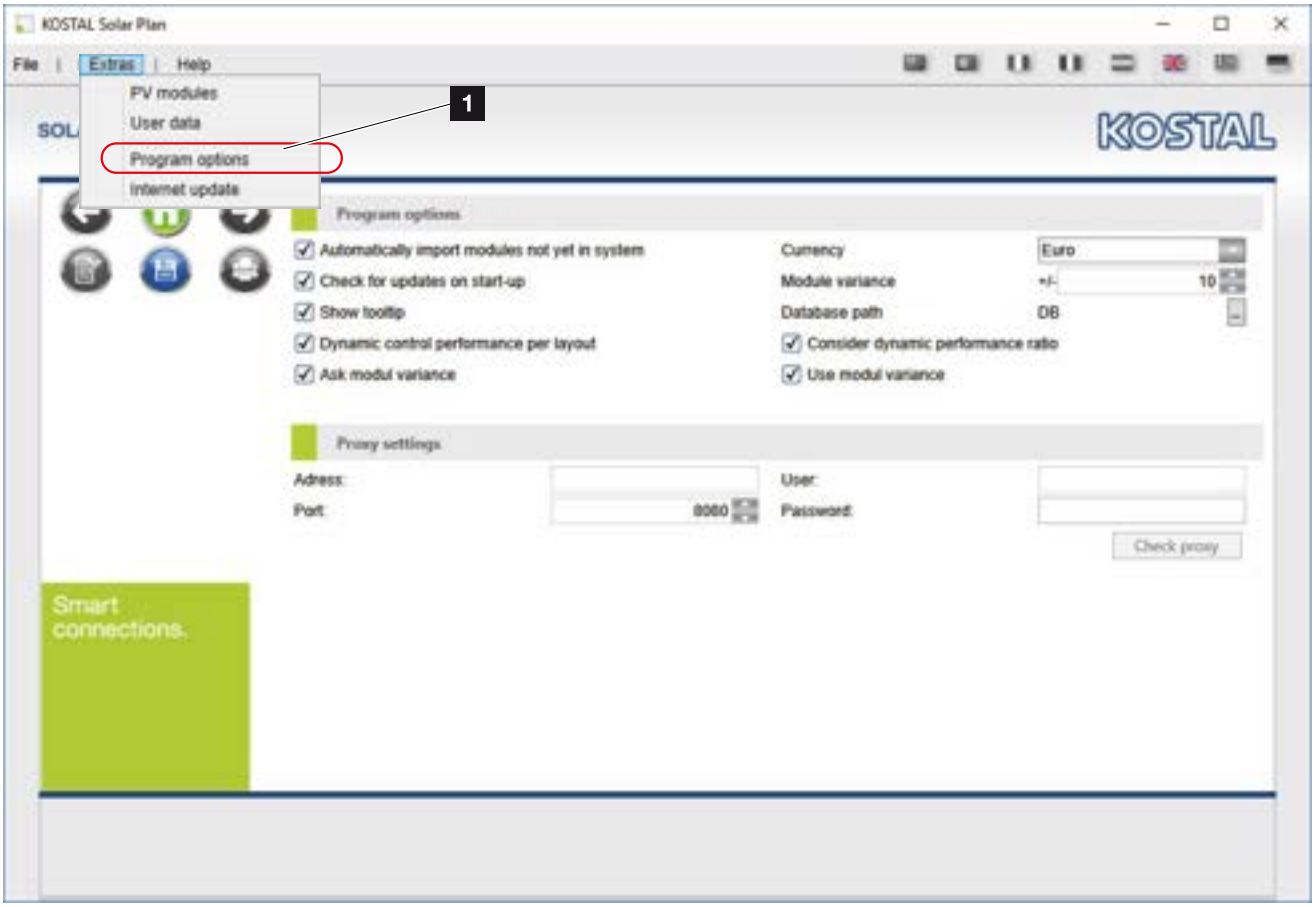

Fig. 10: Program options

Under "Extras" > "Program options", automatic updates of modules can be set up and a check for updates initialised after the program is started.

If a proxy server is used in the network, the necessary access data of the proxy server must be entered here. The settings can then be checked.

General functions such as displaying tooltips, currency and program start can also be set up here.

The settings for calculating the dynamic performance ratio and module variance are specified here and appear in the planning depending on setting.

INFO

Under dynamic performance ratio, the user can use a simulation to dynamically determine the performance ratio. The performance that can be achieved at the system site is used for this calculation. This means that higher inverter utilisation is possible without overloading it.

The module variance setting allows the program to automatically vary the number of modules during layout within a selected range in order to optimize the layout.

The database path may have to be changed manually in PC systems without writing rights in some ranges. To do this, select the button next to "Database path DB".

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2.9 Internet update overview

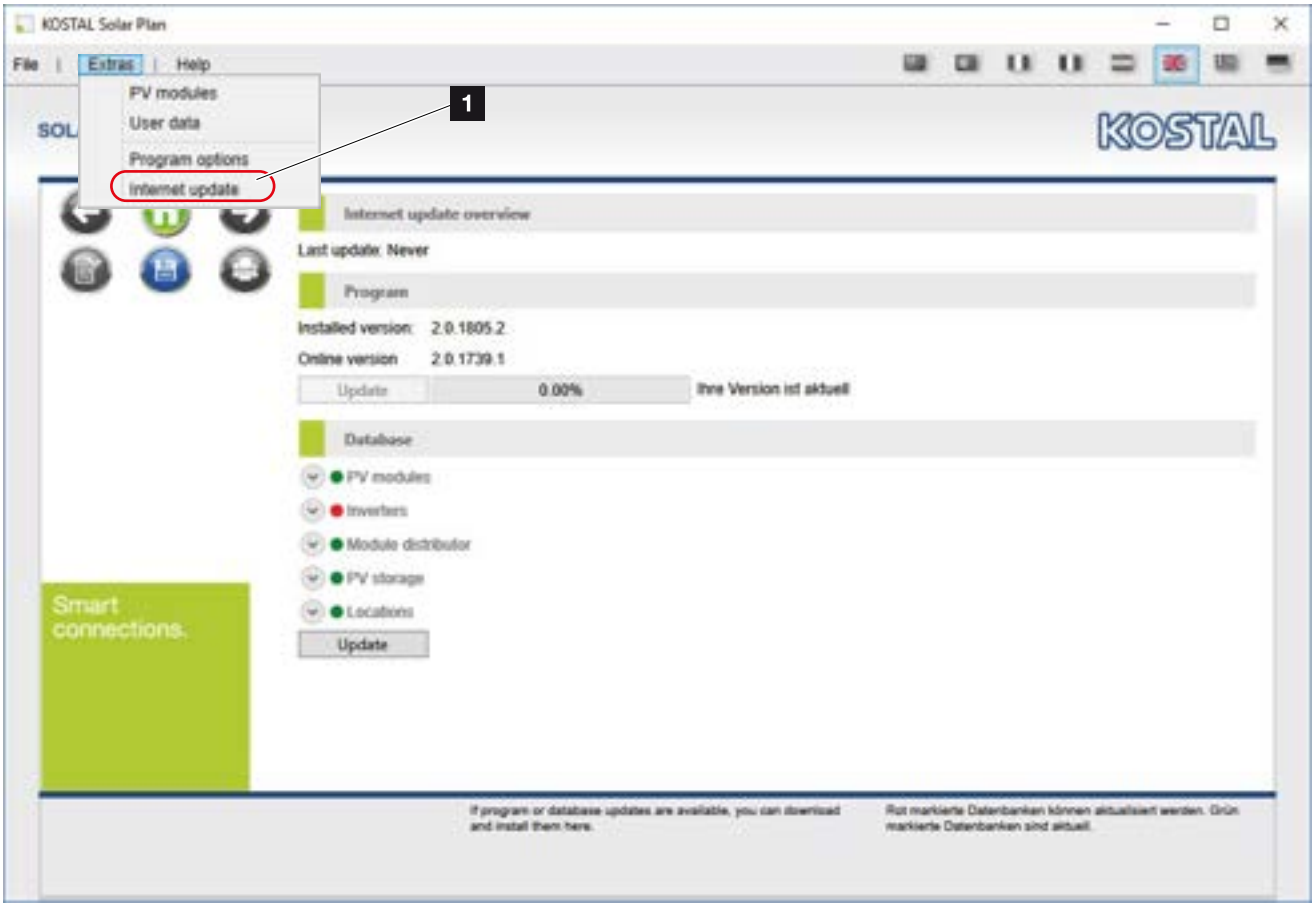

Fig. 11: Update

Under "Extras" > "Internet update" the program manually checks whether an update is currently available.

Pressing the "Update" button starts the update.

INFO

If an update is available, this is indicated by a red dot, which turns green after a successful update.

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3. Use of KOSTAL Solar Plan

3.1 Creating a plan 28

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3.1 Creating a plan

The new version of the KOSTAL Solar Plan software provides planners of photovoltaic systems with three options for creating a plan.

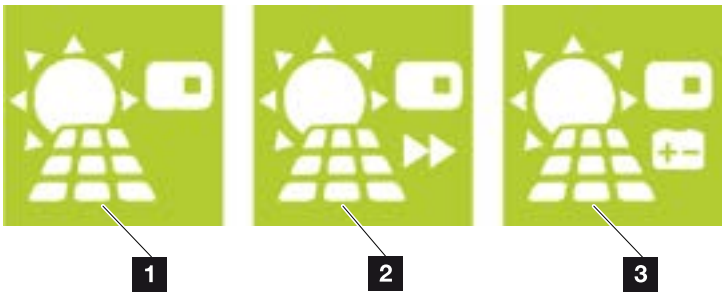

Fig. 12: Plan selection

1 Layout Ch. 4.1
A complete inverter layout is created under "Layout". Here the user is guided one step at a time through the photovoltaic system planning. At the end, the inverter layout can be saved and a printed copy made available to the customer.

2 Rapid Layout Ch. 5.1
Users who know which photovoltaic components they want to use and only want to compare the system specification with the inverter specification should select this rapid layout option. Here the user specifies an inverter, the photovoltaic modules to be used and the corresponding wiring. As a result, the software generates all the necessary information about where the layout lies within the technical limits.

3 Storage Layout Ch. 6.1
A complete photovoltaic system plan with an additional PIKO BA storage system is created under "Storage Layout". Otherwise, planning is the same as when selecting "Layout".

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4.1 Inverter layout

A complete photovoltaic system plan is created using the "Layout" button or by going to "File" > "New project".

The user is then guided one step at a time through photovoltaic system planning, which takes account of all the components of a photovoltaic system.

Fig. 13: Inverter layout button

Press the "Layout" button.

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4.2 Starting layout

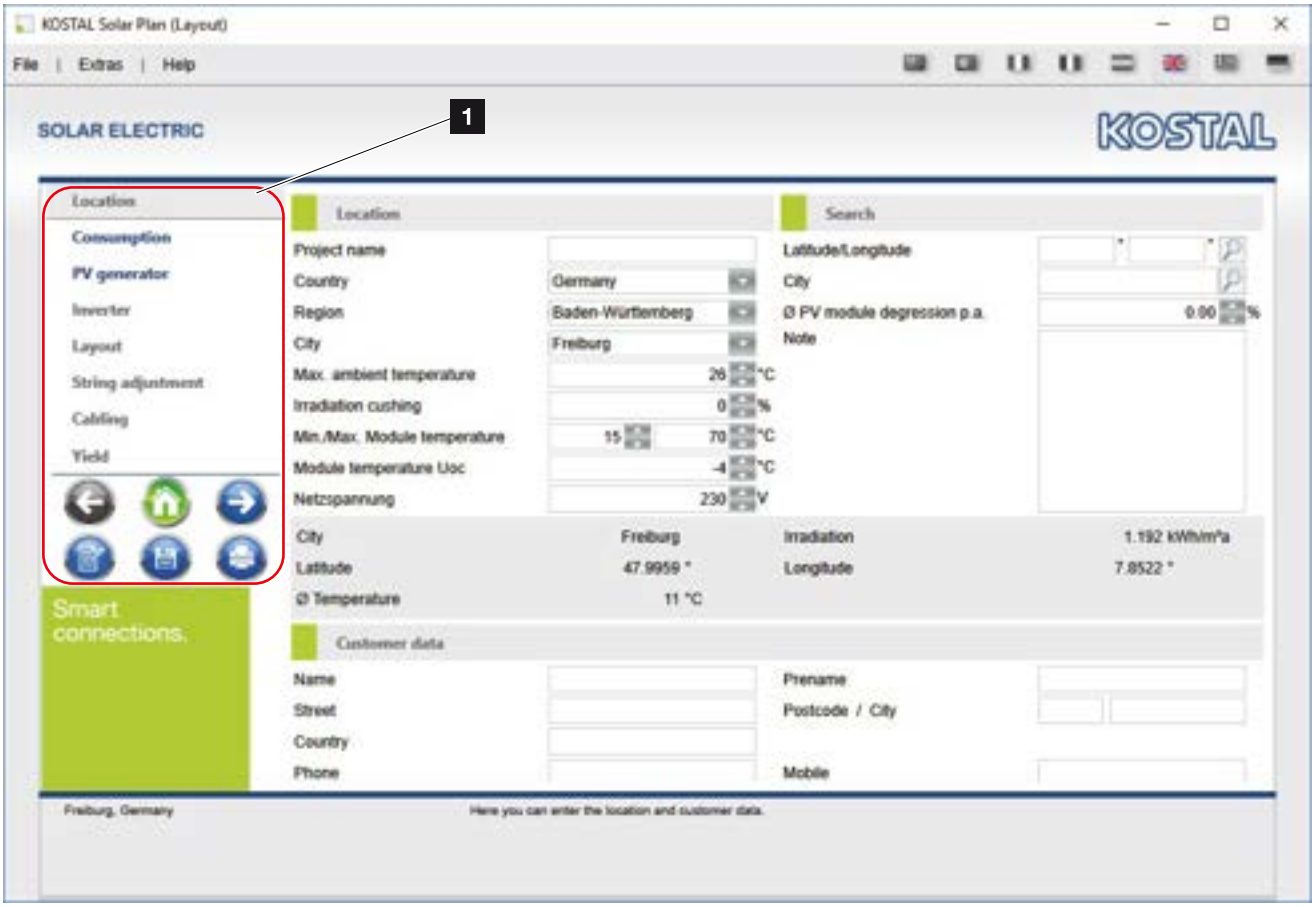

Fig. 14: PV project - Layout start screen

To the left is the navigation bar, where you can see where you are in the project. In order to move one step back or forward, use the blue arrow in the desired direction, or directly click on the desired step, highlighted in blue.

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4.3 Creating project location

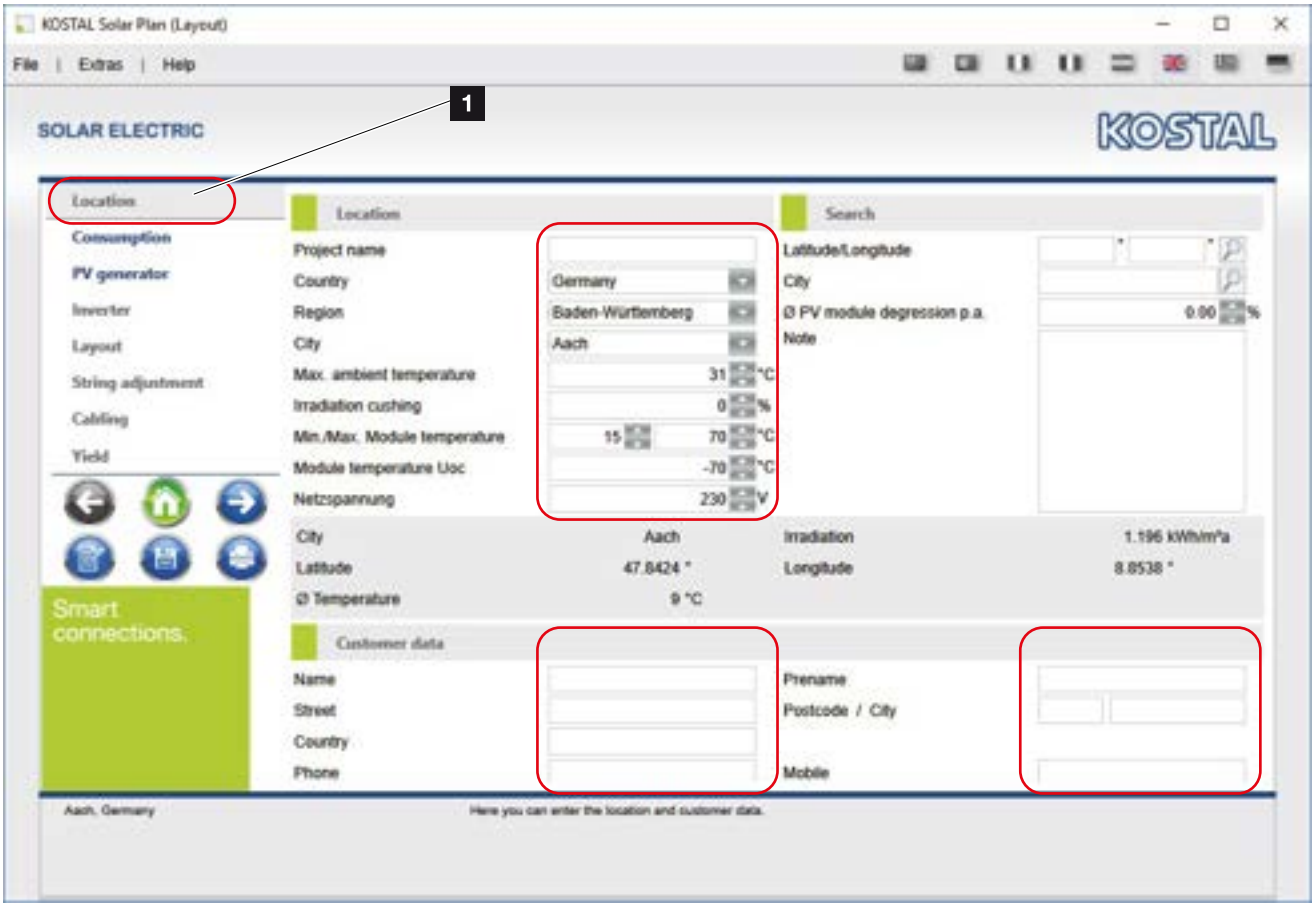

Fig. 15: PV project - Creating location

Give the project a name and enter the rest of the details about the location and customer. This data is used later on in the printed file.
The indicated location is necessary for layout with relation to the irradiation and temperature data saved on location.

Press the right arrow to go to the next page.

INFO

In the event of shading or inferior, location-related irradiation conditions, you can adapt the irradiation dampening to suit your needs.

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4.4 Taking account of annual consumption

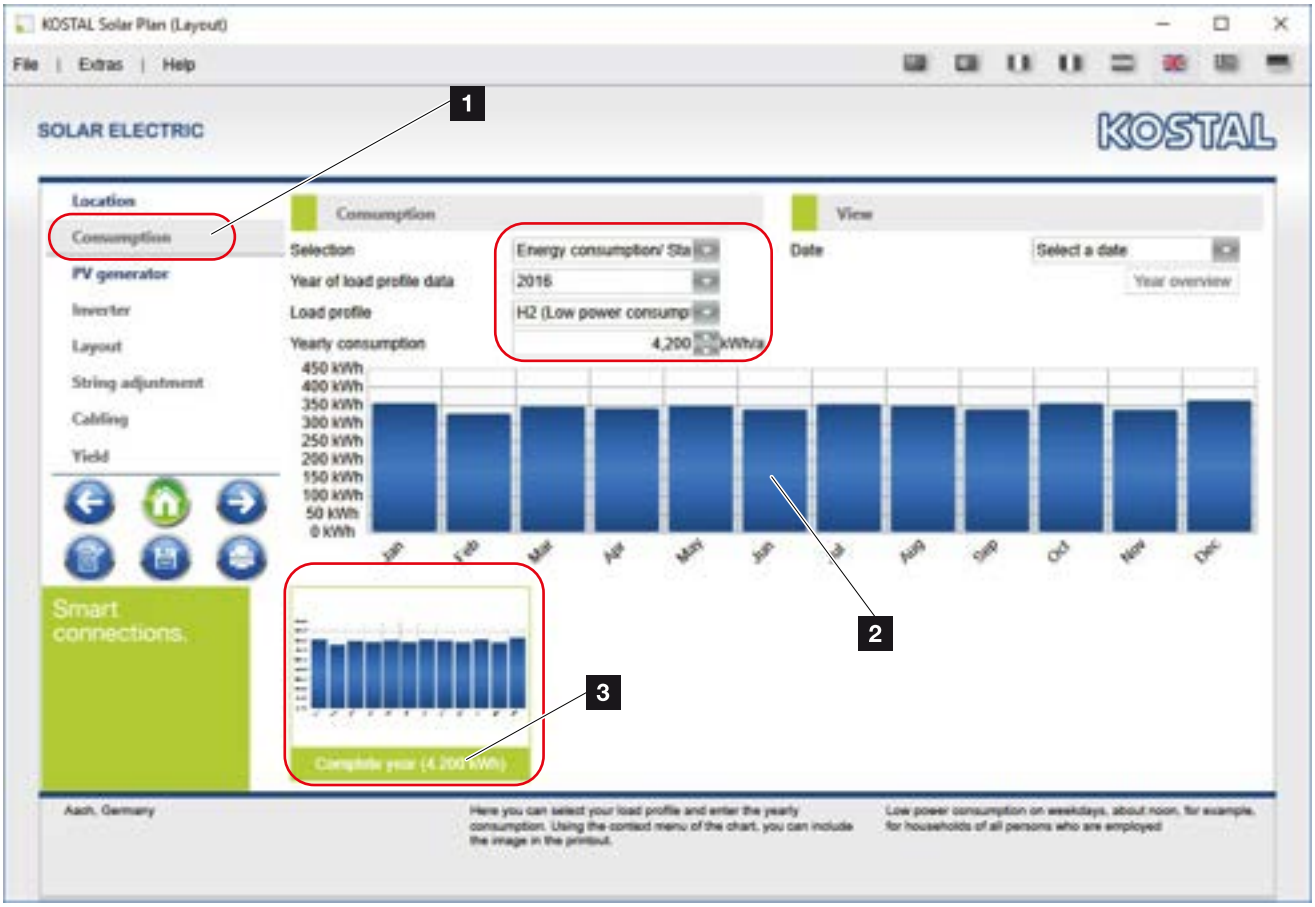

Fig. 16: PV project - Taking account of consumption

Annual consumption for planning can be entered on the "Consumption" page. This is taken into account in the calculation later on.

Select an appropriate load profile and enter the assumed annual consumption or that from the previous year.

A bar chart of the calculated annual consumption is produced.

Press the right arrow to go to the next page.

It is essential that consumption is entered in order to determine the self-consumption proportion or degree of self-sufficiency.

INFO

If you right-click on the diagram, you can add the diagram to the print-out.

Several diagrams can be added to the print-out.

You can delete added diagrams by clicking on their names.

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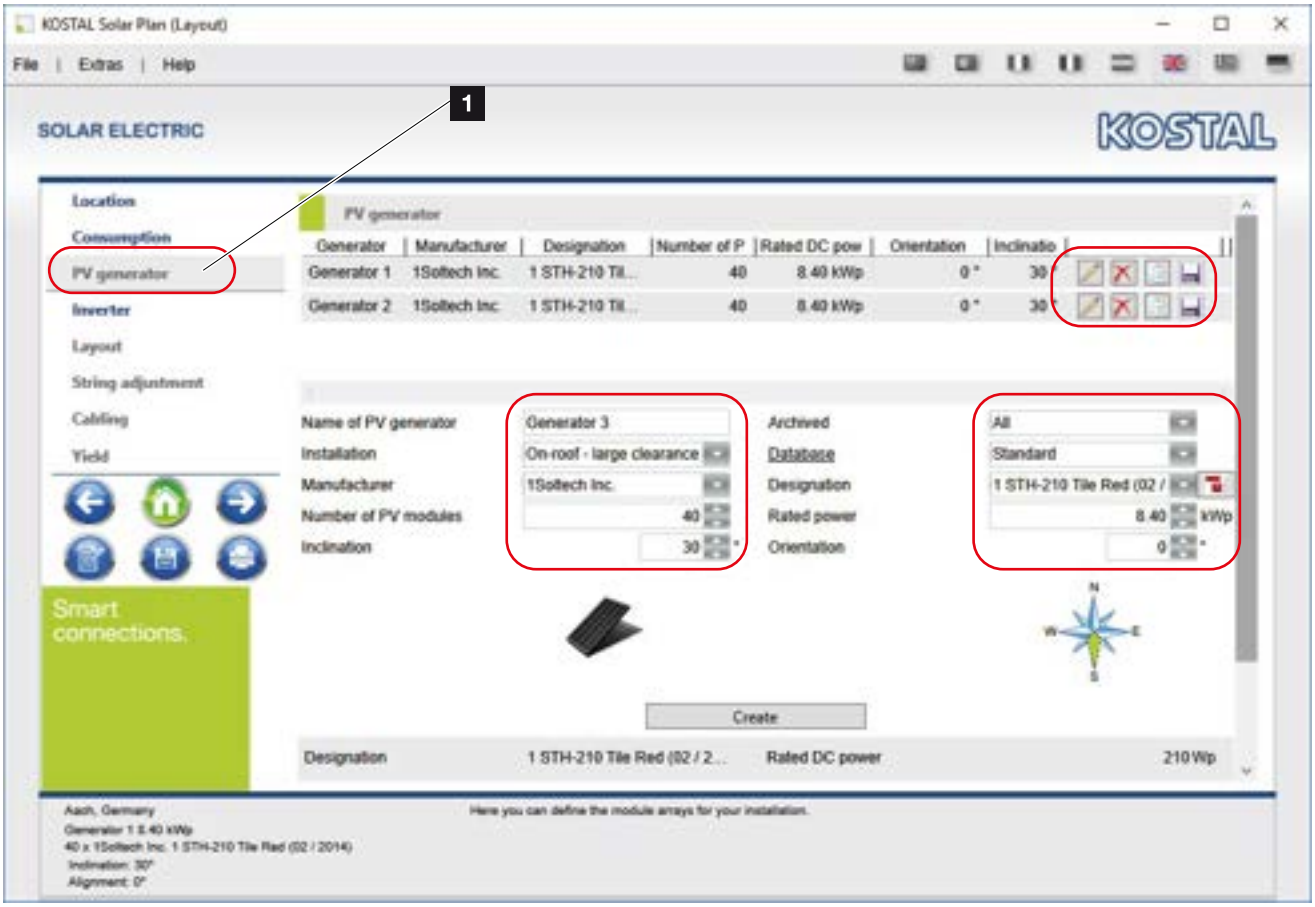
4.5 Selecting PV generator



PV project - Creating PV generators

Under "PV generator" a max. of 3 different PV generators (roofs incl. inclination and alignment) with modules (manufacturer and designation) and the desired rated output or the number of modules can be indicated. The data entered is confirmed by pressing the "Create" button.

The diskette symbol is used to confirm the change.

An automatic calculation of the performance ratio (PR) with reference to the alignment is undertaken for up to 3 generators. Consult the Inverter page for more details.

Press the right arrow to go to the next page.

INFO

If a PV generator that has already been created is to be processed, deleted or copied, use the buttons (pencil to edit, X to delete, letter to copy, diskette to save) next to the created generator.

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4.6 Selecting inverter

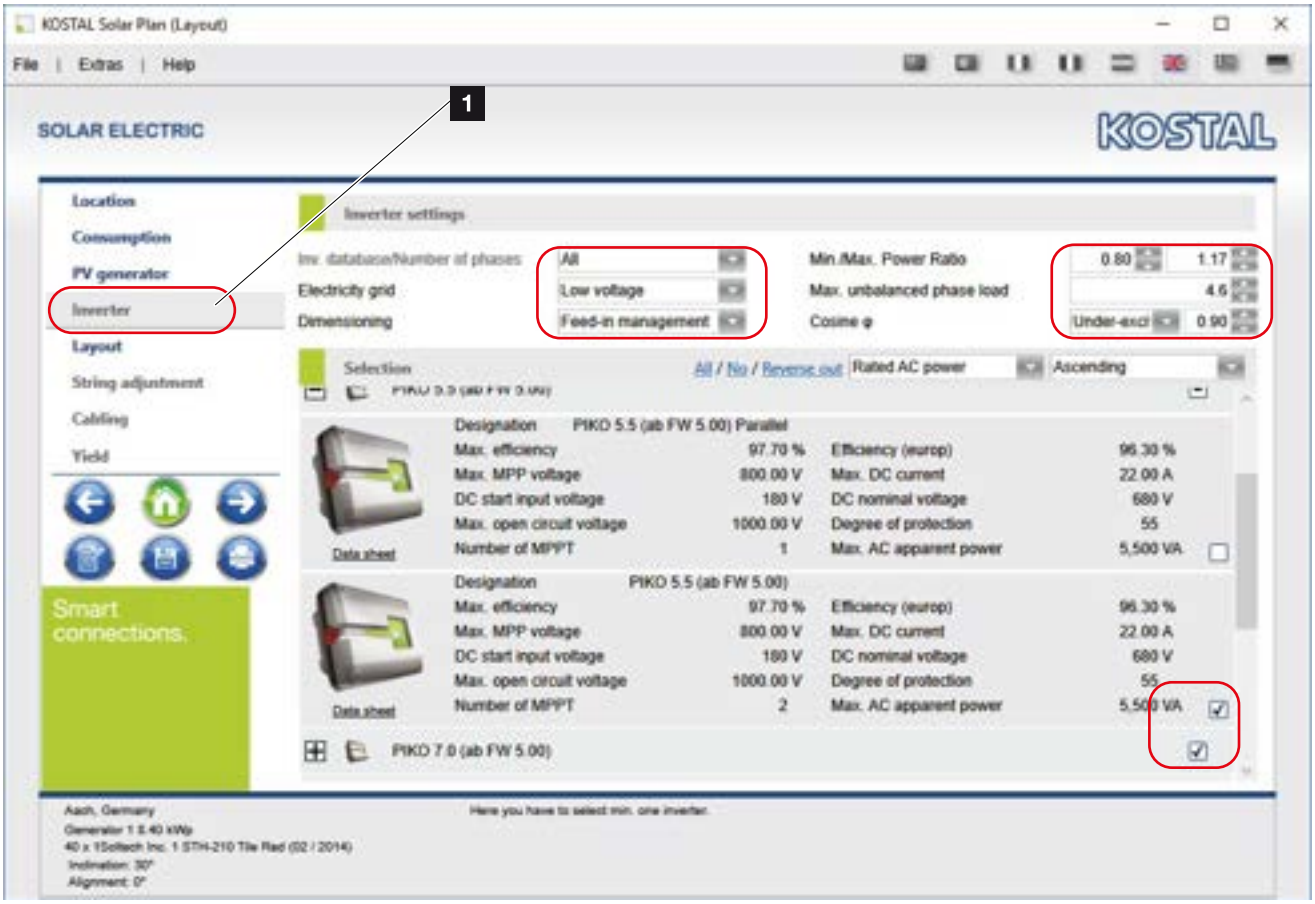

Fig. 17: PV project - Selecting inverter

Here the required grid settings (in some cases) prescribed by the grid operator are to be entered.

In the event that an inverter is to be excluded from the layout calculation, this can be deselected with the help of the corresponding check to the right.

The calculation is started by pressing the right arrow.

INFO

To select/deselect several inverters or to reverse the selection, the "All" / "No" / "Reverse out" function can be used as well as sorting.

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Dynamic performance ratio

Depending on the settings made in the program options for KOSTAL Solar Plan, the dynamic performance ratio calculation is provided here. When determining the performance ratio, the user can choose between a static and dynamic performance ratio calculation.

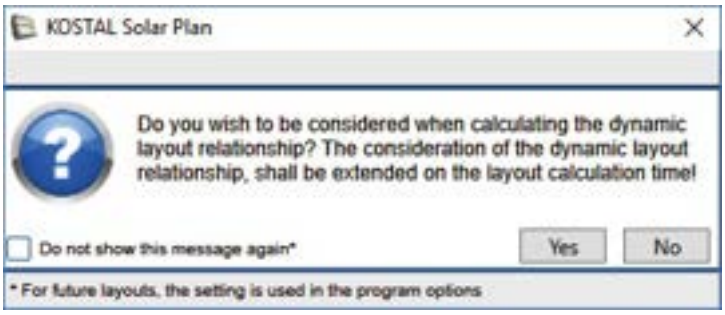

Fig. 18: Question - Dynamic layout ratio

To perform the dynamic calculation, answer the question with "Yes".

Module variance

If a layout is not possible with the number of modules you have specified, the program offers a module variance once this has been set under "Program option". Which layout would be possible with which number of modules is then checked within the deviation range you have set (up to max. 10 modules).

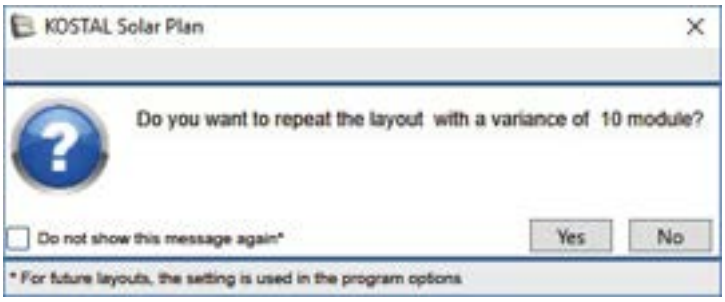

Fig. 19: Question - Module variance

To perform the calculation, answer the question with "Yes".

INFO

The performance ratio is the ratio of a PV generator's output power to the power drawn by the associated inverter. This ratio depends on the efficiency at which the inverter is working, i.e. how much of the DC power present is being converted into usable AC power.

The static performance ratio is faster to calculate and uses the PV rated output that can be found in the inverter's technical data.

The dynamic performance ratio takes longer to calculate and is based on the power that can be achieved at the system location.

INFO

Please note that it may take several minutes for the layout to be calculated because of the simulation running in the background.

If it is taking too long, you can exit the calculation using the "Cancel" button.

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4.7 Inverter layout

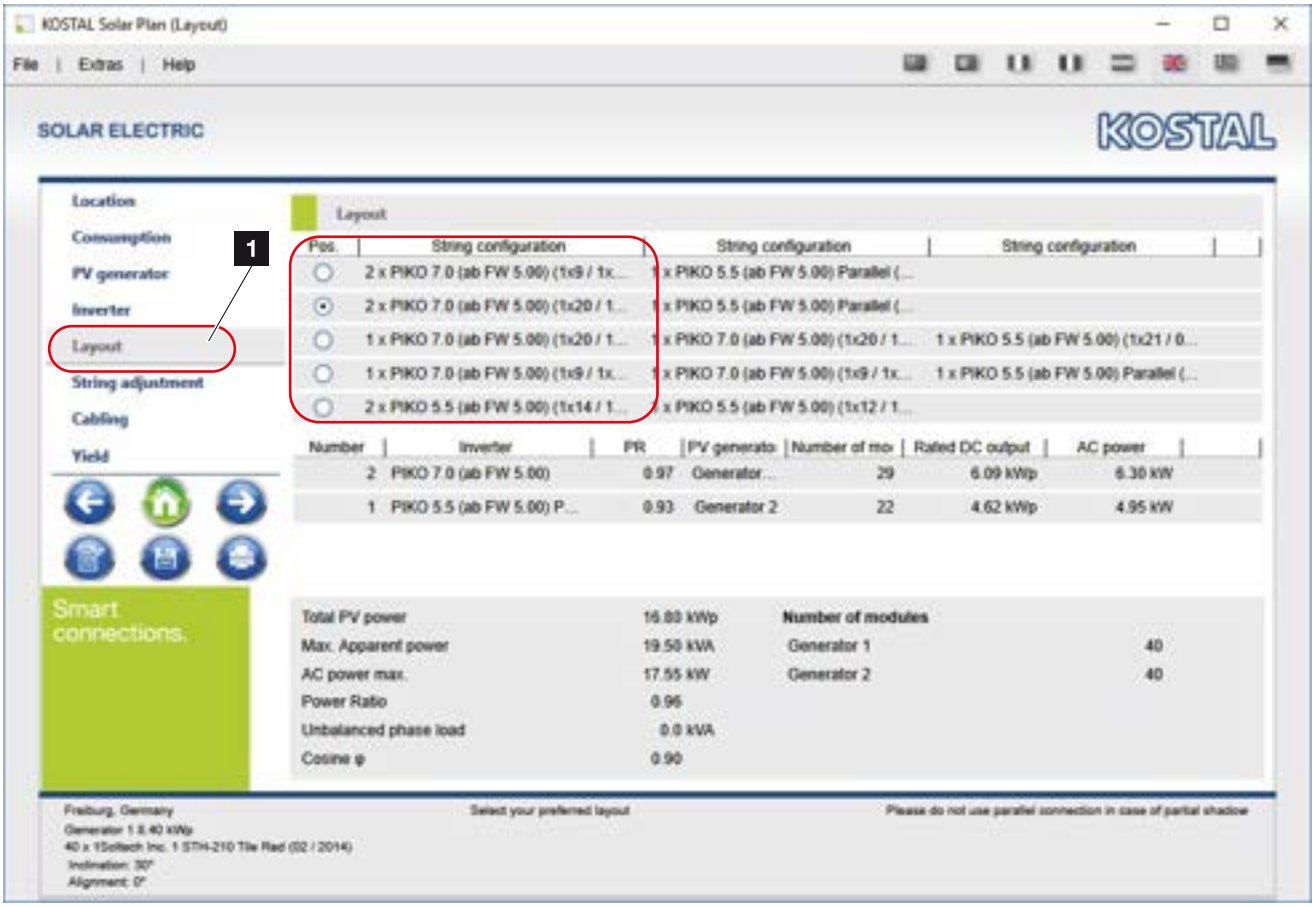

Fig. 20: PV project - Inverter layout

In this step KOSTAL Solar Plan calculates the 5 most favourable inverter layouts.

Now select the one best for you. You can change the wiring if need be in the next step.

Press the right arrow to go to the next page.

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4.8 Inverter rewiring

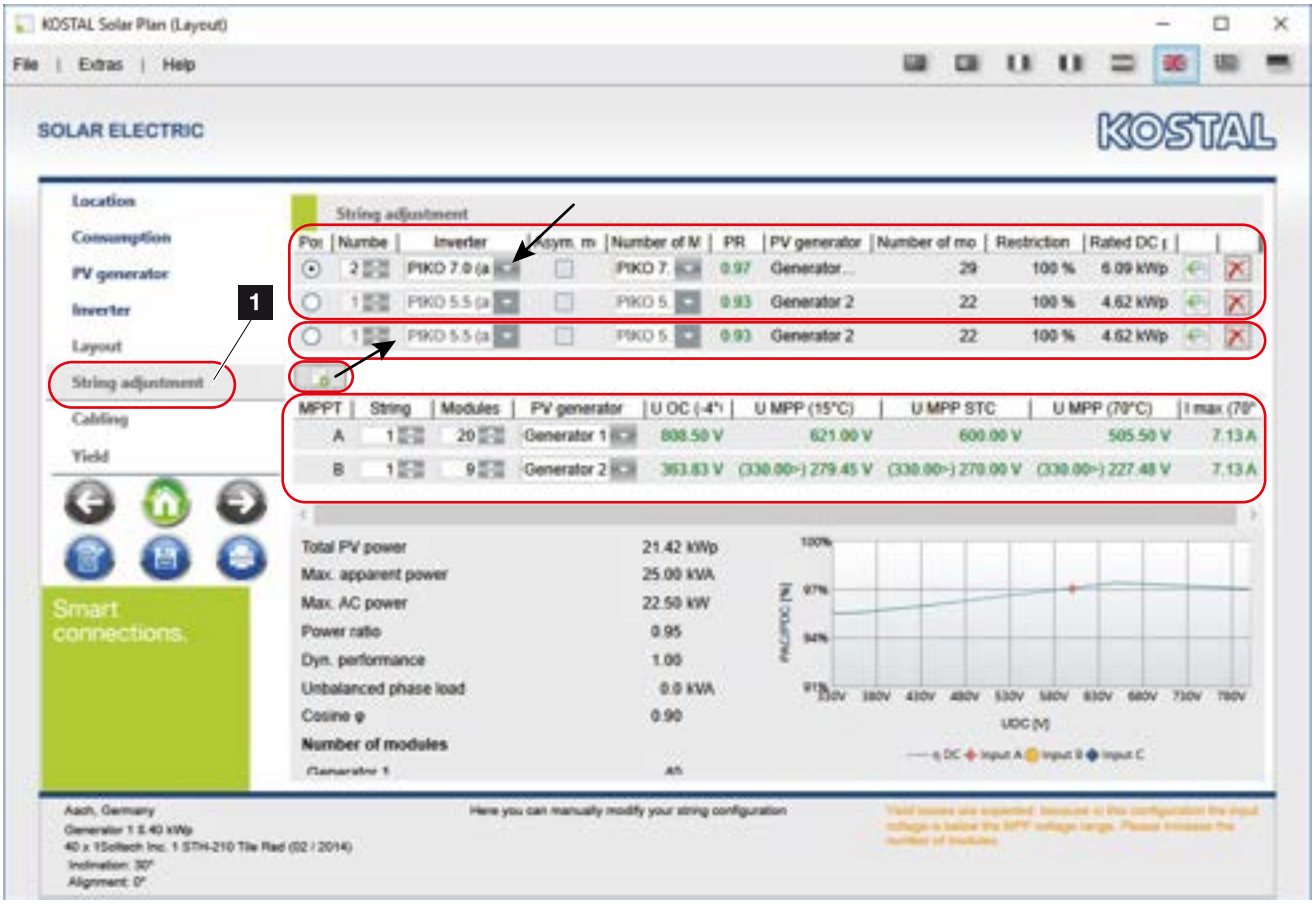

Fig. 21: PV project - Inverter rewiring

In the rewiring, the selected inverter can be edited, changed, deleted or another inverter can be added from the previous design calculation using the “Add inverter” button.

In the "Number of MP" column the user can select whether the standard inputs are to be used or whether the inputs should be connected parallel.

In the lines below it is then possible under "Modules" to vary the respective number of modules, the connected strings and the selected PV generators.

Press the right arrow to go to the next page.

INFO

If using different inverters (please note data sheet details), the inputs can be laid out asymmetrically in relation to the currents present. To do this, select the checkbox under Asymmetric to adapt the maximum current level accordingly.

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4.9 PV system wiring

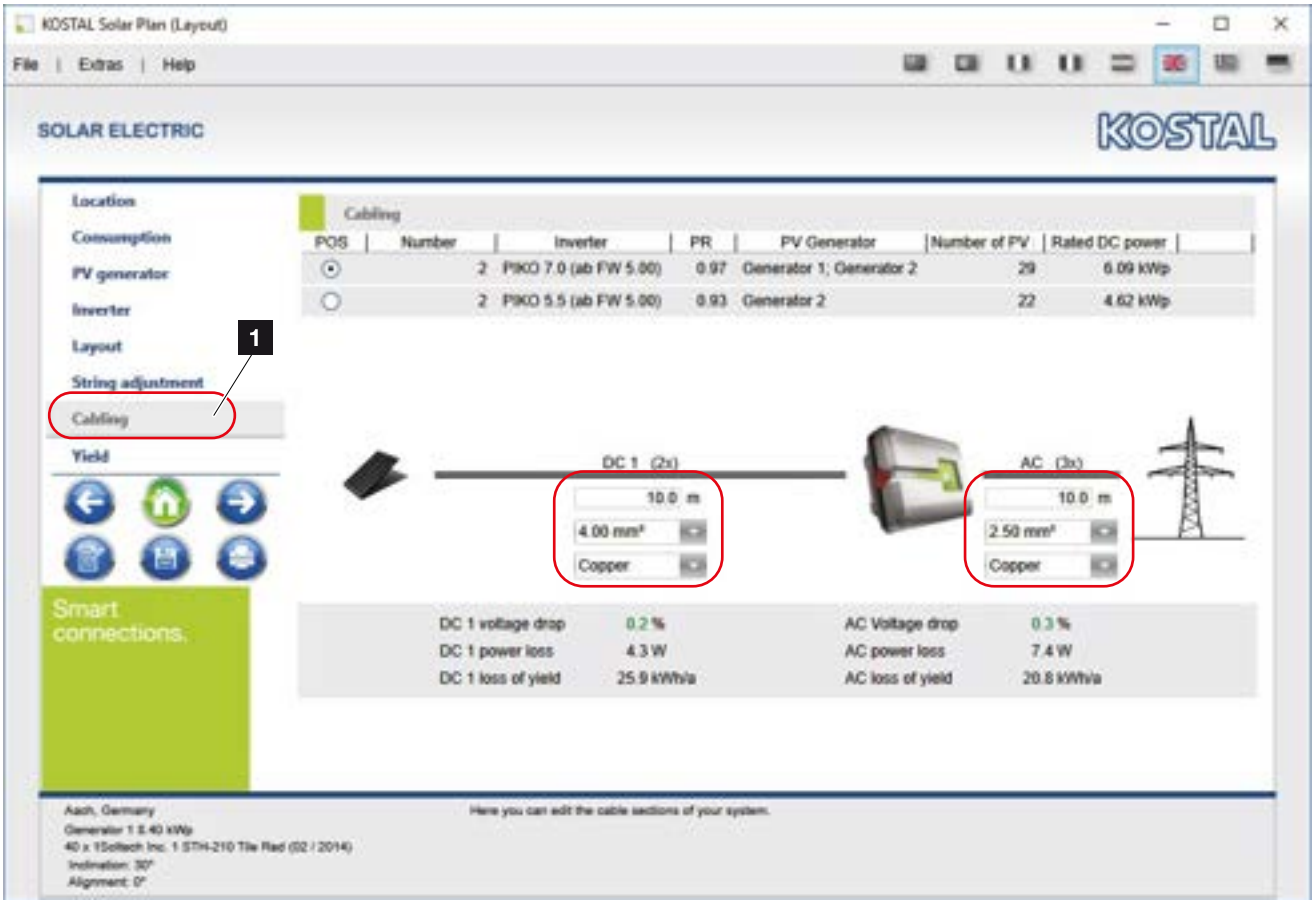

Fig. 22: PV project - Inverter wiring

The lengths, cable cross-sections and material used between the PV generator and the inverter, as well as between the inverters and the AC connection, are to be indicated under wiring.

These values are incorporated into the calculation of the yield.

Press the right arrow to go to the next page.

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4.10 PV system yield

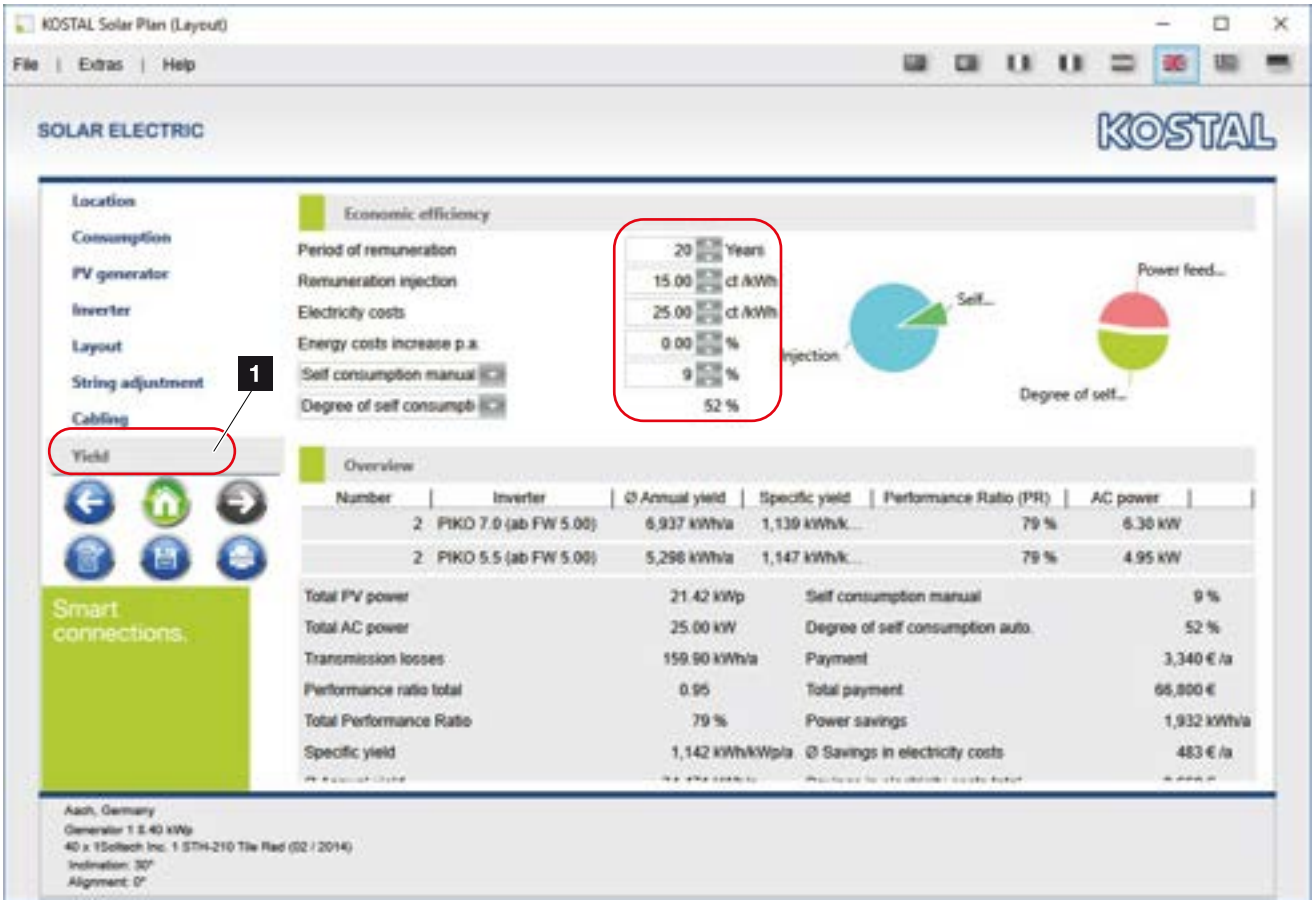

Fig. 23: PV project - Inverter yield data

The yield calculation is explained in the example below.

Enter the number of years, the remuneration value in cents for which remuneration is guaranteed and the electricity costs you pay for one kWh. In addition, a percentage of the electricity cost increase per year can be awarded.

If you want to change the self-consumption, select this item and enter the corresponding percentage.

INFO

An overview of the yield calculation (e.g. yield, remuneration, avoided CO2 emissions) can be found in the bottom area.

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4.11 Calculation and print preview

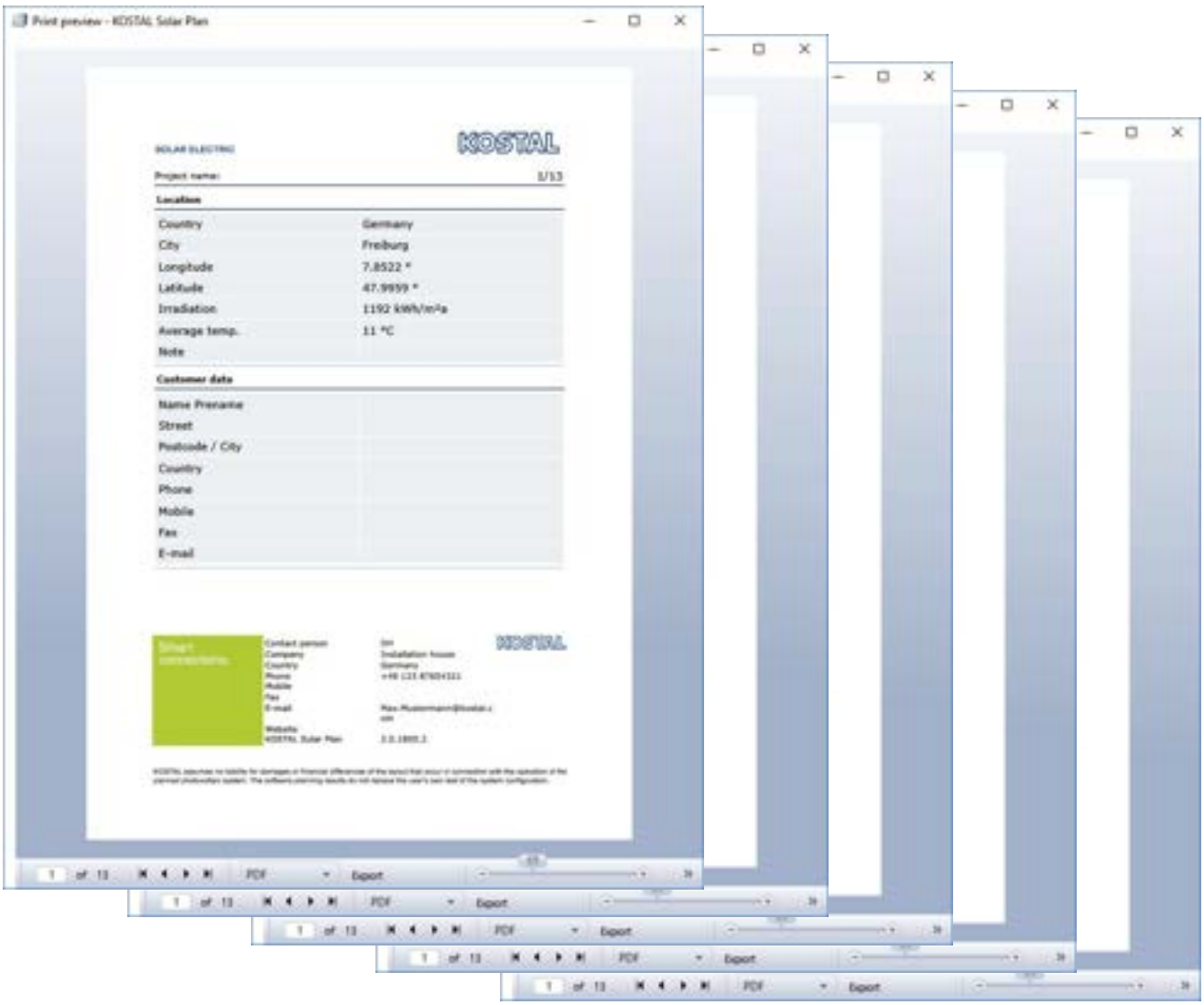

Fig. 24: PV project - Calculation and print preview

After all entries have been completed and the calculation has been carried out, with the "Print preview" button it is possible to view, save and/or print out the summarised PDF document with all necessary data (incl. your contact data) in order to make it available to the customer.

You can also export the data using the "Export" button. First select the export format you want.

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5. Rapid inverter layout

5.1 Rapid inverter layout 43

5.2 Starting rapid layout 44

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5.1 Rapid inverter layout

The rapid layout is intended for users who know which devices they want to use and just want to quickly check something.

Here the user selects an inverter, the photovoltaic modules to be used and the corresponding wiring. As a result, the software generates all the necessary information about where the layout lies within the technical limits.

Fig. 25: Rapid inverter layout button

Press the "Rapid inverter layout" button.

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5.2 Starting rapid layout

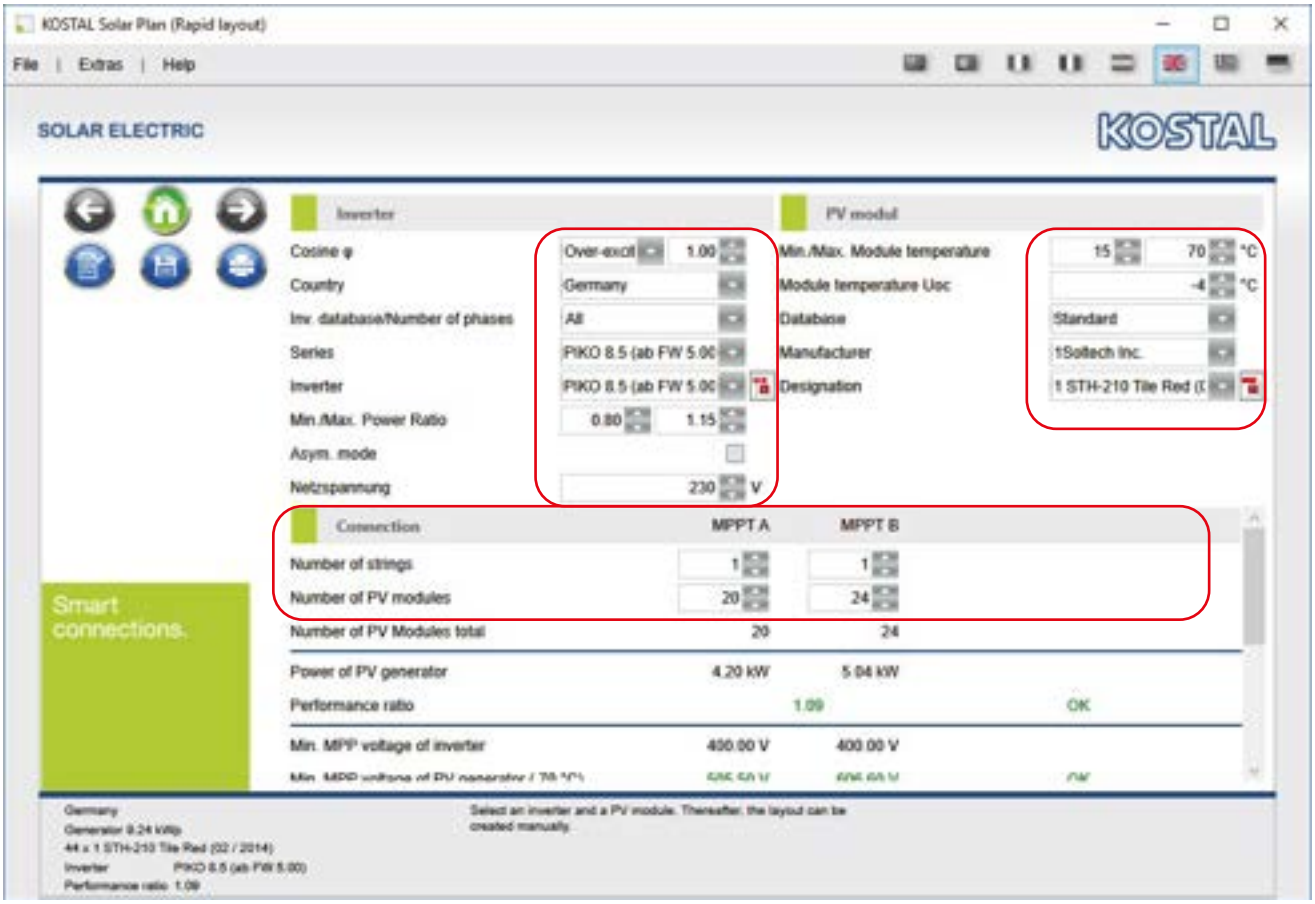

Fig. 26: Rapid Layout

Planning is undertaken regardless of location and without the wiring being automatically determined.

The user specifies the inverter, number of modules and string length. The software immediately shows whether the selected wiring is within the technical limits or where problems may arise.

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6. Inverter storage layout

6.1 Inverter storage layout 46

6.2 Starting storage layout 47

6.3 Selecting battery inverter 48

6.4 Selecting battery storage 49

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6.1 Inverter storage layout

A complete photovoltaic system plan with an additional PIKO BA storage system is created under "Storage Layout".

Here the user is guided one step at a time through battery inverter planning to produce a detailed plan, which takes account of all the components in a PV system.

Fig. 27: Inverter storage layout button

Press the Storage layout button.

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6.2 Starting storage layout

Planning is exactly the same as when performing planning by going to "Layout". So only the differences are shown here.

- Start planning from the start screen by pressing the "Storage layout" button
- Create PV system location **Ch. 4.3**
- Create planned annual consumption **Ch. 4.4**
- Select PV generators **Ch. 4.5**
- **Chose Storage, Hybrid or PV Inverter with Storage Inverter** **Ch. 6.3**
- Inverter layout **Ch. 4.7**
- Inverter rewiring **Ch. 4.8**
- **Selecting battery storage** **Ch. 6.4**
- PV system wiring **Ch. 4.9**
- PV system yield **Ch. 4.10**
- Calculation and print preview **Ch. 4.11**

INFO

The storage layout is only available if only storable inverters have been selected (eg PLENTICORE plus).

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6.3 Selecting battery inverter

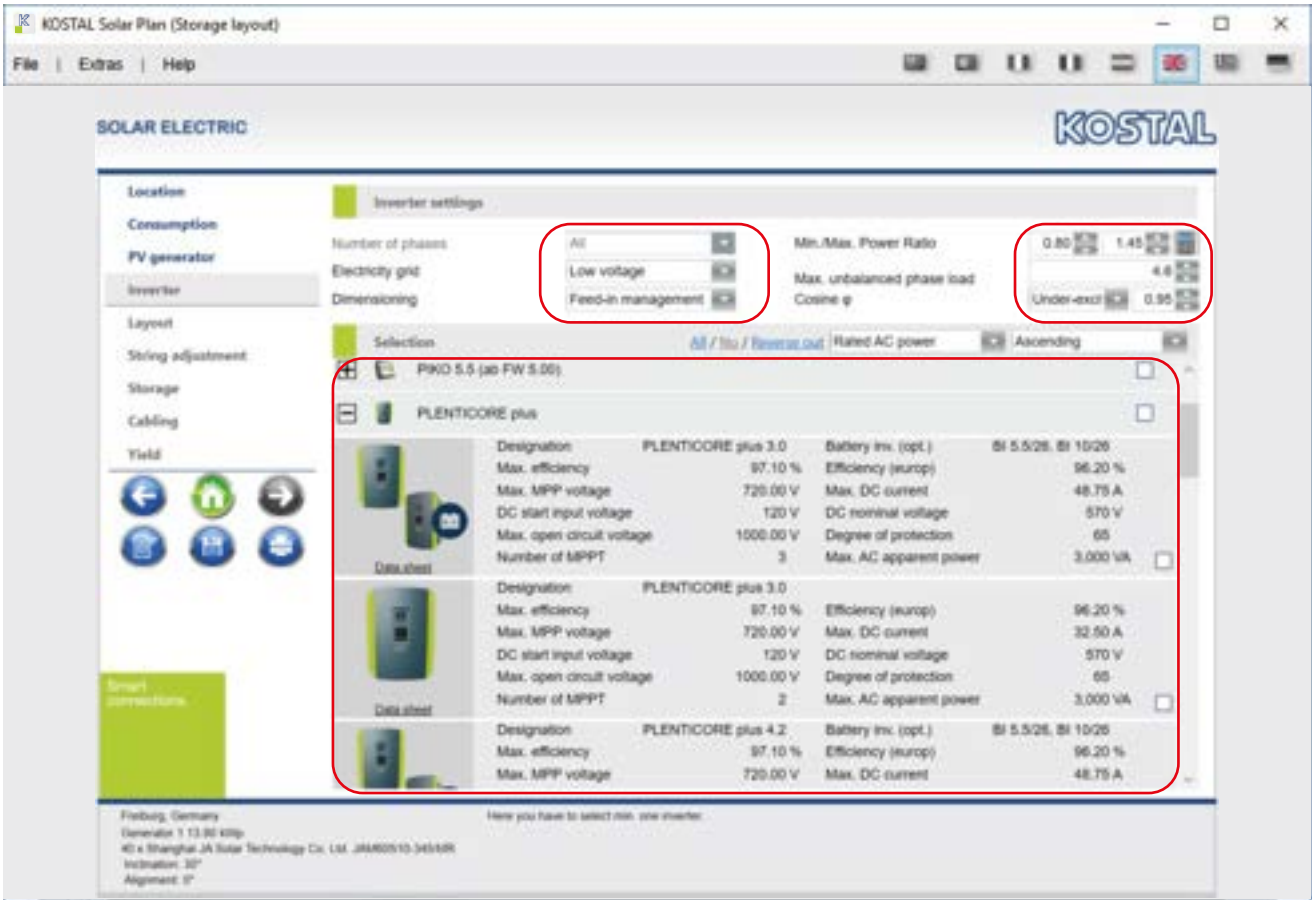

Fig. 28: Selecting battery inverter

Once the steps "**Creating project location**", "**Taking account of annual consumption**" and "**Selecting PV generator**" have been performed, chose Storage, Hybrid or PV Inverter with Storage Inverter. Also enter the grid settings for the battery inverter (sometimes) required by the grid operator.

The calculation is started by pressing the right arrow.

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6.4 Selecting battery storage

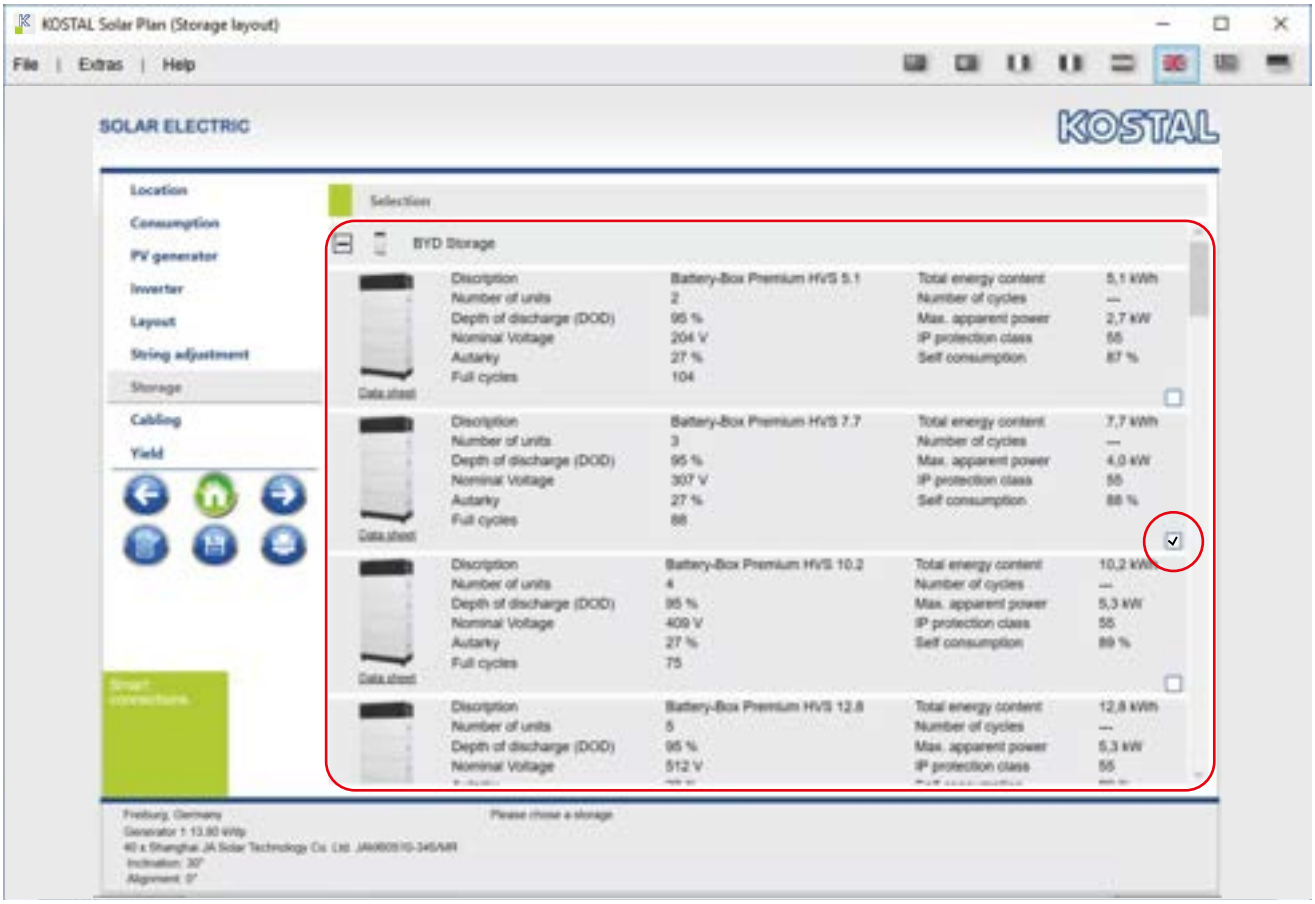

Fig. 29: Select battery storage

Once the other intermediate steps for "**Inverter layout**" and "**Inverter rewiring**" have been performed, select a battery storage.

The different potential self-consumption proportions and degrees of self-sufficiency are displayed in this view.

The battery storage is accepted by pressing the right arrow.

The next steps are to plan the "**PV system wiring**", "**PV system yield**" and "**Calculation and print preview**".

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