SOLAR ELECTRIC





Smart connections.

Operating Instructions

Planning tool PIKO Plan 2.0 for PIKO 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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Content

1.	General information	5
1.1	Proper use	7
1.2	About this manual	10
1.3	Notes in this manual	12
1.4	Symbols used	16
2.	The program	17
2.1	About PIKO Plan	18
2.2	The installation	19
2.3	The user interface	20
2.4	The menu bar	21
2.5	The buttons	22
2.6	Entry of the user data	23
2.7	The PV module database	24
2.8	Program options	25
2.9	Internet update overview	26
3.	Use of PIKO Plan	27
3. 3.1	Use of PIKO Plan Creating a plan	27 28
 3.1 4. 	Use of PIKO Plan Creating a plan Inverter layout	272829
 3.1 4. 4.1 	Use of PIKO Plan Creating a plan Inverter layout Inverter layout	27282930
 3.1 4. 4.1 4.2 	Use of PIKO Plan Creating a plan Inverter layout Inverter layout Starting layout	2728293031
 3.1 4.1 4.2 4.3 	Use of PIKO Plan Creating a plan Inverter layout Inverter layout Starting layout Creating project location	 27 28 29 30 31 32
 3.1 4.1 4.2 4.3 4.4 	Use of PIKO Plan Creating a plan Inverter layout Inverter layout Starting layout Creating project location Taking account of annual consumption	 27 28 29 30 31 32 33
 3.1 4.1 4.2 4.3 4.4 4.5 	Use of PIKO Plan Creating a plan Inverter layout Inverter layout Starting layout Creating project location Taking account of annual consumption Selecting PV generator	 27 28 29 30 31 32 33 34
 3.1 4.1 4.2 4.3 4.4 4.5 4.6 	Use of PIKO Plan Creating a plan Inverter layout Inverter layout Starting layout Creating project location Taking account of annual consumption Selecting PV generator Selecting inverter	 27 28 29 30 31 32 33 34 35
 3.1 4.1 4.2 4.3 4.4 4.5 4.6 4.7 	Use of PIKO Plan Creating a plan Inverter layout Inverter layout Starting layout Creating project location Taking account of annual consumption Selecting PV generator Selecting inverter Inverter layout	 27 28 29 30 31 32 33 34 35 37
 3.1 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 	Use of PIKO Plan Creating a plan	 27 28 29 30 31 32 33 34 35 37 38
 3.1 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 	Use of PIKO Plan Creating a plan Inverter layout Inverter layout Starting layout Creating project location Taking account of annual consumption Selecting PV generator Selecting inverter Inverter layout Inverter rewiring PV system wiring	 27 28 29 30 31 32 33 34 35 37 38 39
 3.1 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 4.10 	Use of PIKO Plan Creating a plan Inverter layout Inverter layout Starting layout Creating project location Taking account of annual consumption Selecting PV generator Selecting inverter Inverter layout Inverter rewiring PV system wiring PV system yield	 27 28 29 30 31 32 33 34 35 37 38 39 40

5.	Rapid inverter layout	42
5.1	Rapid inverter layout	43
5.2	Starting rapid layout	44
6.	Inverter storage layout	45
6.1	Inverter storage layout	46
6.2	Starting storage layout	47
6.3	Selecting battery inverter	48
6.4	Selecting battery storage	49

Index

50

1. General information

1.1	Proper use	. 7
1.2	About this manual	10
1.3	Notes in this manual	12
1.4	Symbols used	16

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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1.1 Proper use

The PIKO Plan 2.0 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.

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 PIKO 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.

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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.

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.

1.2 About this manual

Read this manual carefully in its entirety. It contains important information on the installation and operation of the PIKO Plan 2.0 layout tool.

This manual applies to software version 2.0.1513.5 and higher.

This manual is part of the software and applies exclusively to the PIKO Plan 2.0 layout tool from KOSTAL Solar Electric GmbH.

The instructions for the PIKO Plan 2.0 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 PIKO Plan.



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

This saves paper and the document remains easy to read.

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



- 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, lt. 2

Fig. 2: Examples of cross-references

1.3 Notes in this manual

Installation A

Installing the wall mount and hanging the invertor

Mark the positions of the drill holes at the installation site by using the wall mount as a drilling template.

1

- Drill holes and insert wall ancho/s if necessary.
- Screw the wall mount to the intended surface.
- Use the supplied screws.

Connecting AC-side

We recommend a mains cable with the cross-section $3 \times 2.5 \text{ mm}^2$. The outer diameter of the cable can be 9...17 mm, the cross-section of the individual conductors can be a max. of 4 mm² for flex ble cables and a max. of 6 mm² for rigid cables. For flexible cables, we recommend using core end sleeves.

Remove the sheath and the insulation of the mains cable as much as needed.

First thread the unscrewed union nut and then the sealing ring over the cable.

2 DANGER Risk of death due to electrical shock Always disconnect the device from the power supply during installa-tion and before maintenance and repairs and lock it to prevent it being switched back on. 3 **IMPORTANT NOTE** Press the blind plug and the sealing ring out of the screw connection from the inside outwards using a screwdriver or similar implement. 4 NOTE To connect the AC and DC cables, the inverter is equipped with spring-

loaded terminal strips.

Fig. 3: Safety instructions in this manual

- Reference icon within the instruction text
- 2 Warning
- Information note
- 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.

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

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

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.

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.



operated, maintained and repaired by trained and qualified staff.

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.



This is additional information.

INFO

Fig. 6: Example of an information note

Symbols within the additional notes



Information or tip

Enlarged representation

1.4 Symbols used

Symbol	Meaning
1), 2), 3)	Sequential steps in a handling instruction
→	Effect of a handling instruction
1	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
lt.	Item
Ch.	Chapter

2. The program

2.1	About PIKO Plan	. 18
2.2	The installation	. 19
2.3	The user interface	. 20
2.4	The menu bar	. 21
2.5	The buttons	22
2.6	Entry of the user data	. 23
07	The DV module detabase	04
2.1		24
2.8	Program options	. 25
2.9	Internet update overview	. 26

2.1 About PIKO 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 PIKO Plan 2.0 for its PIKO 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 PIKO 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.



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.

2.2 The installation

The PIKO Plan 2.0 planning tool must be installed on a PC with the Windows operating system.

Download the software from the homepage of KOS-TAL Solar Electric (www.kostal-solar-electric.de) under "Download" > "PIKO Multi-String Inverters" and install on your Windows system.

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



The following systems are supported: Windows 7, Windows 8

2.3 The user interface



Fig. 7: Start screen

- 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.
- Inverter layout This selection undertakes complete planning of the inverter with selected PV modules and wiring.

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.

2.4 The menu bar

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

Tab. 3: Menu item: Extra

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

Tab. 4: Menu item: Help

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
Ð	Go to next page in project
G	Go to previous page in project

2.6 Entry of the user data

E		KOSTAL PIKO Plan 2.0 ()		×
File Extras Help				U U 🗆 🕷 🖻 🖷
PV modules	1			
SOI User data				KOSTAL
Program options				
Internet update	User data			
	Contact person	DH	Company	installation house
	Street	Musterstr. 15	Postcode / City	79103 Freiburg
	Country	Germany		
	Phone	+49 123 87654321	Mobile	
	Fax			
	E-mail	Max.Mustermann@kostal.cor	Internet site	www.kostal-solar-electric.com
			Company logo	Search Delete
		/		KOSTAL
Smart				
connections.		2		
		Here you can store your 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.

2.7 The PV module database

		KOSTAL PIKO PI	an 2.0 ()				
e Extras Help					U.		
PV modules							
SOI User data	1					KOS	STAL
Program options							
Internet update							
	PV modules						
	Database	Standard	- Se	earch			2
	Manufacturer	Designation	Rated powe	Cell technology	Favourites		~
	1Soltech Inc.	1 STH-210 Tile Red	210 Wp	Polykristallin		(🖉 🗙 🕞 😭 🗖	1)
	1Soltech Inc.	1 STH-210 Tile Red (11 / 2012	210 Wp	Polykristallin		/ 🗡 🗈 🙀 🗖	1
	1Soltech Inc.	1 STH-220 Emerald Green	220 Wp	Polykristallin		/ 🗙 📑 🟹 🗖	1
	1Soltech Inc.	1 STH-220 Emerald Green (11	220 Wp	Polykristallin		/ 🗙 🖹 😭	1
	1Soltech Inc.	1 STH-220 poly (10 / 2011)	220 Wp	Polykristallin 2	2 🕤	/ 🗙 🗈 🙀 🖥	1
	1Soltech Inc.	1 STH-225 Forest Green	225 Wp	Polykristallin		/ 🗙 🖹 😭 🗖	
	Manufacturer *	yuraku pte ltd.	D	esignation *		A-M204	
	Max. system voltage *	1000.00	V C	ell type *		Monocrystalline	-
	MPP power STC *	204	W Le	ength/Width/Height *		1474 995 50	mm
	MPP voltage STC *	26.94	V M	IPP voltage STC (initia	I)	0.00	V
Smart	MPP current STC *	/.58	A M	IPP current STC (initia	1)	0.00	A
connections.	Short-circuit current STC *	8.15	A or	pen circuit voltage STC	C (initial)	0.00	V
	TC open circuit voltage *	-112	mV/K T	C open circuit voltage	(initial)	0.00	
	TC short-circuit current *	7	mA/K T	C short-circuit current	(initial)		mA/K
	TK rated power *	-754.80	mW/K T	K rated power (initial)		0.00	
				K rated power (initial)	1	0.00	
					new	reset	Cancel
		Here you can manage your own modul module favourites.	e database and r	mark your * Mandato	ory fields		

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.



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

2.8 Program options

E				KOSTAL PIKO Plan 2.0 ()			- 🗆 🗙
File	Extra	as Help				u u ≡	*
		PV modules	1				
SO		User data				KC	DSTAL
_		Program options					
		Internet update	Program options				
				t vet in system	Currency	Furo	
	E		Check for updates on start-up	yet in system	Module variance	+/-	10
			 Tooltipp anzeigen 		Datenbanken-Pfad	DB	
			Dyn. Leistungsverhältnis Frage and Andread Strategiesen Strategiese	anzeigen?	Dynamisches Leistungsverhä	iltnis berücksichtiger	1
			Modulvarianz fragen		Modulvarianz verwenden		
			Programmstart	Home			
			Proxy settings				
			Adress:		User:		
			Port:	8080 🌲	Password:		
						CI	neck proxy
S	mar	t					
	Unine						

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.



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".

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.

3. Use of PIKO Plan

3.1 Creating a plan

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



Fig. 12: Plan selection

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 A 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.

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".

4. Inverter layout

4

4.1	Inverter layout	30
4.2	Starting layout	31
4.3	Creating project location	32
4.4	Taking account of annual consumption	33
4.5	Selecting PV generator	34
4.6	Selecting inverter	35
4.7	Inverter layout	37
4.8	Inverter rewiring	38
4.9	PV system wiring	39
4.10	PV system yield	40
4.11	Calculation and print preview	41

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.

4.2 Starting layout

le Extras Help		KOSTAL PIKO Plan 2.0 (Layou	t)	
SOLAR ELECTRIC	1			KOSTAL
Location	Location		Search	
Consumption PV generator	Project name Country	Germany	Latitude/Longitude City	· · · · · · · · · · · · · · · · · · ·
Inverter Layout	Region City	Baden-Württemberg Aach	Note	
String adjustment Cabling	Max. ambient temperature Irradiation cushing Min./Max. Module temperature	31 ↓ °C 0 ↓ % -10 ↓ 70 ↓ °C		
	City Latitude Ø Temperature	Aach 47.8424 ° 9 °C	Irradiation Longitude	1.196 kWh/m²a 8.8538 °
	Customer data			
Smart connections.	Name Street Country		Prename Postcode / City	
	Phone Fax		Mobile E-mail	
Aach, Germany	Here you	can enter the location and customer data.		

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.

4.3 Creating project location

E	ł	KOSTAL PIKO Plan 2.0 (Layou	t)	- 🗆 🗙
File Extras Help			1	
SOLAR ELECTRIC	1			KOSTAL
Location	Location		Search	
PV generator	Project name	PV-Musteranlage	Latitude/Longitude	
Inverter	Region	North Rhine-Westphalia	City	
Layout	City	Aachen	Note	
String adjustment	Max. ambient temperature	28 🌲 °C		
Cabling	Irradiation cushing	0 🌲 %		
Yield	Min./Max. Module temperature	-10 70 °C)	
	City	Aachen	Irradiation	1.074 kWh/m²a
	Latitude	50.7766 °	Longitude	6.0834 °
	Customer data	90		
Smart	Name	Berg	Prename	Tom
Connectione.	Street	Talstraße 1	Postcode / City	66123 Berghausen
	Country	Deutschland		
	Phone	0789 123456	Mobile	
	i dA			
Aachen, Germany	Here you o	an enter the location and customer data.		

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.



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

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.



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.

4.5 Selecting PV generator



Fig. 17: 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.



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.

4.6 Selecting inverter



Fig. 18: 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.



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

Dynamic performance ratio

Depending on the settings made in the program options for PIKO 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. 19: 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. 20: Question - Module variance

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



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.



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.

4.7 Inverter layout

E	KOSTAL F	PIKO Plan 2.0 (Lay	out)		-	×
File Extras Help			1			9
SOLAR ELECTRIC					KOST	AL
Location	Lavout					
Consumption	Pos. String configuration	Stri	ng configuration	String of	configuration	1.1
PV generator	O 1 x PIKO 4.2 (1x12 / 1x10)					
Inverter	• 1 × PIKO 5.5 (ab FW 5.00) (1×12 /	1x10)				
Layout	O 1 x PIKO 5.5 (1x12 / 1x10 / 0x0)					
String adjustment						
Cabling						
Villa	Number Inverter	PR PV gener	ato Number of mo(Rated	DC output	AC power	
	1 PIKO 5.5 (ab FW 5.00)	1.00 Generato	pr 22	5.17 kWp	5.23 kW	
Smart	Total PV power	5.2 kWp	Number of modules			
connections.	Max. Apparent power	5.50 kVA	Generator 1		10	
	AC power max.	5.23 kW	Generator 2		12	
	Power Ratio	1.00				
	Unbalanced phase load	0.0 kVA				
	Cosine ψ	0.95				
Aachen, Germany Generator 1 2.35 kWp 10 x SolarWorld AG SW 235 mono bla Inclination: 42* Alignment: 50*	Select your preferred la	yout				

Fig. 21: PV project - Inverter layout

In this step PIKO 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.

4.8 Inverter rewiring

	KOST	AL PIKO Plan 2.0 (La	ayout)					
; Extras Help						U .	= #	1
SOLAR ELECTRIC						[KOS	TAI
Location	String adjustment							
Consumption	Pos Nurr Inverter Asym. mo	C Number of MP P	R PV genera	ator Number	of mod Re	striction F	Rated DC I	ower
PV generator	• 1 PIKO 5.5 (ab	PIKO 5.5 🔹 1.1	18 Generator	r	26	100 %	6.1	1 kWp 📀
Inverter 1								
Lavout								
String adjustment								~
String adjustment	MPPT String Modules PV ger	nerator U OC (-10 U	U MPP (-10 L	MPP STC	J MPP (70°	I SC (70°		
Cabling		027.47 V	500.99 V	454.50 V	307.01 V	0.35 A		
Yield	B 1 11 Genera	460.14 V	371.80 V	333.30 V	283.80 V	8.35 A		
	Total PV power	6.1 kWp						
	Max. apparent power	5.50 kVA	98%				_	_
	Max. AC power	5.23 kW	[%]					
Smart	Power ratio	1.18	8 95%					
connections.	Dyn. performance	1.13	PAG					
	Unbalanced phase load	0.0 kVA	92%					
	Cosine φ	0.95	525V	575V	625V	675V	725V	775V
	Number of modules				UDC	; [V]		
	Generator 1	11		r	DC 🔶 Input A	🔵 Input B 🔶 li	nput C	
Aachen, Germany Generator 1 2.35 kWp 10 x SolarWorld AG SW 235 mono bl Inclination: 42° Alignment: 50°	Here you can man ack (07 / 2010)	ually modify your string confi	guration	Due to th	e low DC voltag	e there are ef	fects on the	efficiency.

Fig. 22: PV project - Inverter rewiring

In the rewiring, the inverter selected in the previous layout calculation can be edited.

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.



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.

4.9 PV system wiring

E	KOSTAL PIKO Plan 2.0 (Layout)	- 🗆 🗙
File Extras Help		
SOLAR ELECTRIC		Kostal
Location	Cabling	
Consumption	POS Number Inverter PR PV Generator Nur	nber of PV Rated DC power
PV generator	• 1 PIKO 5.5 (ab FW 5.00) 1.00 Generator 1; Generator 2	22 5.17 kWp
Inverter		
Layout 1		
String adjustment		
Cabling		
Yield	DC 1 (2x)	AC (3x)
	12.8 m 4.00 mm ² Copper	6.4 m 1.50 mm ² Copper
Smart	DC 1 voltage drop 0.3 % AC Voltage drop	0.3 %
	DC 1 power loss 6.9 W AC power loss	4.8 W
	DC 1 loss of yield 27.5 kWh/a AC loss of yield	0.0 kWh/a
Aachen, Germany Generator 1 2.35 KWp 10 x Solar/World A2 Inclination: 42° Alignment: 50°	Here you can edit the cable sections of your system. k (07 / 2010)	

Fig. 23: 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.

4.10 PV system yield

E	KOSTAL F	PIKO Plan 2.0 (Layout)		- 🗆 ×
File Extras Help				
SOLAR ELECTRIC				KOSTAL
Location	Economic efficiency			
Consumption	Period of remuneration	20 Years	Netzbezug	
PV generator	Remuneration injection	15.00 Ct /kWh		
Inverter	Electricity costs	25.00 🌲 ct /kWh		
Layout	Self consumption auto.	40 %	Self c	onsumption
String adjustment				
Cabling	Number	Annual viold Specie	fic vield Porformance Patio (PP)	AC nowor
Yield /	1 PIKO 5.5 (ab FW 5.00)	4624 kWh/a 894 kV	Vh/kWp/a 79 %	5.23 kW
	Total PV power	5.17 kWp	Self consumption	40 %
	Total AC power	5.50 kW	Degree of self consumption	44 %
Smart	Transmission losses	27.55 kWh/a	Payment	416 € /a
connections.	Performance ratio total	1.00	Total payment	8,323€
	Total Performance Ratio	79 %	Power savings	1,849 kWh/a
	Specific yield	894 kWh/kWp/a	Savings in electricity costs	462 € /a
	Annual yield	4,624 kWh/a	Savings in electricity costs total	9,247 €
	Total yield	92,472 kWh	CO ₂ emissions avoided	2,774 t
Aachen, Germany Generator 1 2.35 kWp 10 x SolarWorld AG SW 235 mono blac Inclination: 42° Alignment: 50°	k (07 / 2010)			

Fig. 24: 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.

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



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

4.11 Calculation and print preview

0	Print preview	- KOSTAL PIKO Plan 2.0	- 🗆 ×							
				^		□ ×				
					^		□ ×			
		KOSTAL				^		□ ×		
	SOLAR ELECTRIC						^		□ ×	
	Project name:	1/10						<u>^</u>		
	Location	Company							Ê	
	City	Freiburg								Ê
	Longitude	7.8522 °								
	Latitude	47.9959 °								
	Irradiation	1192 kWh/m²a								
	Average temp.	11 °C								
	Note									
	Customer data									
	Name Prename									
	Street									
	Postcode / City									
	Phone									
	Mobile									
	Fax									
	E-mail									
	Smart Contact pers	on DH installation house								
	Country Phone Mobile	Germany +49 123 87654321								
	Fax E-mail	Max.Mustermann@kostal.c								
	Website	om www.kostal-solar-								
	KOSTAL PIKO	electric.com D Plan 2.0 2.0.1514.13								
	KORTAL assumes to liability for damages or finan	cial differences of the layout that occur in connection with the operation of the								
	planned photovoltaic system. The software plannin	g results do not replace the user's own test of the system configuration.								
1 of 10 H		Export	- • 🔒							
			-							
2		Icel 2007 * Export	•							
	3 01 0 14 4	Excel 2007 Export			-					
	4 01 0	Excel 2007 Export								
		S OF & IT EXCEL2007	Export	FUNDAT	-					
				Export						
			Exce	EXC EX						
		0		Excel 20		Apolit				191

Fig. 25: 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.

5. Rapid inverter layout

5

5.1	Rapid inverter layout	 43	
5.2	Starting rapid layout	 44	

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. 26: Rapid inverter layout button

Press the "Rapid inverter layout" button.

5.2 Starting rapid layout

1	KOSTAL PIKO Pla	n 2.0 (Rapid layout)	- 🗆 🗙
ile Extras Help			
SOLAR ELECTRIC			KOSTAL
600	Inverter	PV modul	
	Cosine φ Over-excit	1.00 Min./Max. Module tempe	erature -10 🗘 70 🌲
	Country Germany	- Database	Standard
	Series PIKO 8.5 (a	FW 5.00 V Manufacturer	SolarWorld AG 🗸
	Inverter PIKO 8.5 (a	FW 5.00 👻 📔 Designation	SW 260 mono black ((📼 👅
	Min./Max. Power Ratio 0.80	1.15	
	Asym. mode		
	Connection	MPPT A MPPT B	^
	Number of strings	1 🔹 1 🛊	
	Number of PV modules	16 🌲 19 🌲	
	Number of PV Modules total	16 19	
Smart	Power of PV generator	4.16 kW 4.94 kW	
connections.	Performance ratio	0.89	ок
	Min. MPP voltage of inverter	800 V 800 V	
	Min. MPP voltage of PV generator (70 °C)	404.40 V 480.23 V	ок
	Max. MPP Spannung Wechselrichter	800 V 800 V	
Germany Generator 7.35 kWp 35 x SW 260 mono black (07 / 2013 Inverter PIKO 8.5 (ab FW Berformance ratio 0.89	Select an inverter and a PV mo created manually. / 5.00)	dule. Thereafter, the layout can be	

Fig. 27: 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.

6. Inverter storage layout

6

6.1	Inverter storage layout	
6.2	Starting storage layout	
6.3	Selecting battery inverter	
6.4	Selecting battery storage	
0.1		10

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. 28: Inverter storage layout button

Press the Storage layout button.

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 **2** Ch. 4.5
- Selecting battery inverter 🔽 Ch. 6.3
- Inverter layout A Ch. 4.7
- Inverter rewiring Ch. 4.8
- Selecting battery storage 2 Ch. 6.4
- PV system wiring 2 Ch. 4.9
- PV system yield **Ch. 4.10**
- Calculation and print preview 2 Ch. 4.11

6.3 Selecting battery inverter

Extras Help	KOSTAL PIKO PIa	n 2.0 (Storage layout	.)	U U = #	
OLAR ELECTRIC				Kos	TA
Location Consumption PV generator Inverter	Inverter settings Min./Max. Power Ratio Max. unbalanced phase load Electricity grid	1.21 ¢ 4.6 ¢	Cosine φ Dimensioning	Under-exci 💌 Feed-in manager	0.95 🌲
Layout String adjustment	Selection	Alle / Keine / Invertie	eren AC-Nennleistung	Aufsteigend	
Storage Cabling	Designation Max. efficiency	PIKO BA Parallel 96.50 %	Efficiency (europ) Min. MPP voltage	95.30 % 440.00 V	•
Yield	Max. MPP voltage DC start input voltage Max. open circuit voltage	850 V 180 V 950.00 V	Max. DC current DC nominal voltage Degree of protection	24.00 A 680 V 55	
888	Data sheet Number of MPPT Designation	1 РІКО ВА	Max. AC-Scheinleistung Efficiency (europ)	10,000 VA 95.30 %	•
Smart connections.	Max. efficiency Max. MPP voltage DC start input voltage Max. open circuit voltage	96.50 % 850 V 180 V 950.00 V	Min. MPP voltage Max. DC current DC nominal voltage Degree of protection	440.00 V 24.00 A 680 V 55	
	Data sheet Number of MPPT	2	Max. AC-Scheinleistung	10,000 VA	V
Aach, Germany Generator 1 4.70 kWp 20 x SolarWorld AG SW 235 mon Inclination: 122	Here you have to select min. b black (07 / 2010)	one inverter.			

Fig. 29: Selecting battery inverter

Once the steps "Creating project location", "Taking account of annual consumption" and "Selecting PV generator" have been performed, a battery inverter is selected. Also enter the grid settings for the battery inverter (sometimes) required by the grid operator.

In the event that a battery 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.

6.4 Selecting battery storage

		KOSTAL PIKO Plan	2.0 (Storage layout)		
le Extras Help					
SOLAR ELECTRIC				[KOSTAL
Location	Selection				
Consumption	Sciection				
PV generator	🖃 🖬 PI	KO Battery Li			
Inverter		Discription	PIKO Battery Li 6.0	Total energy content	6,0 kWh
Lawout		Number of units	5	Number of cycles	6.000
Layout		Depth of discharge (DOD)	90 %	Max. apparent power	3,1 kW
String adjustment		Nominal Voltage	258 V	IP protection class	21
Storage		Full cycles	302	Self consumption	41 %
Cabling	Data sheet				
cability		Discription	PIKO Battery Li 7.2	Total energy content	7,2 kWh
Yield		Number of units	6	Number of cycles	6.000
		Depth of discharge (DOD)	90 %	Max. apparent power	3,7 kW
😏 🕛 ゼ		Autarky	307 V 85 %	Self consumption	43 %
		Full cycles	274	oon concemption	
	<u>Data sheet</u>				
Smart		Discription Number of units	PIKO Battery Li 8.4	Total energy content	8,4 kWh
connections.		Depth of discharge (DOD)	90 %	Max apparent power	4.3 kW
		Nominal Voltage	358 V	IP protection class	21
		Autarky	87 %	Self consumption	43 %
		Full cycles	243		
	Data sheet				
Aach, Germany		Please chose a storage			
Generator 1 4.70 kWp		-0-			
20 x SolarWorld AG SW 235 mono Inclination: 42°	black (07 / 2010)				
Alignment: 50°					

Fig. 30: 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".

Index

A

Annual consumption	. 33
Assume annual consumption	. 33

В

Backup unit, interior	23
Bar chart	33
Battery inverter selected	48

С

Calculation	41
Company logo	23
Create plan	28

D

Dynamic performance ratio	
F	

F

Functions	

Н

Hotline	 6

I

Information concerning installation	10
Internet update	
Inverter layout	30, 37
Inverter storage layout	
Irradiation and temperature data	32

L

Language bar	20
Layout	28, 30
Layout calculation	35, 48

Μ

36
20

Navigation bar	(31
Notes	2,	15

0

perating system

Ρ

Payment	
PDF document	
Performance ratio	
Print preview	
Program options	
Proper use	
PV modules	

R

Rapid inverter layout	43
Rapid Layout	, 43
Rewiring	38

S

afety instructions	2
elect battery storage 4	-9
elect inverter	35
elect PV generator	34
ervice hotline	6
oftware1	9
tart layout	31
torage layout	6
torage Layout	28

U

User data	. 23
V	
Version	. 10
W	
Warnings	. 13
Wiring	. 39
Y	
Yield	. 40
Yield calculation	. 40

Notes:

Notes:



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