SOLAR ELECTRIC





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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1. General information

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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

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.

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.

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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.

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 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.



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.

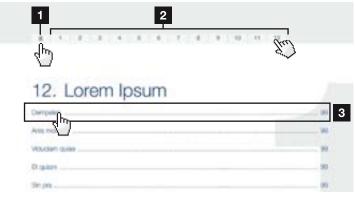


Fig. 1: Navigation through the document

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

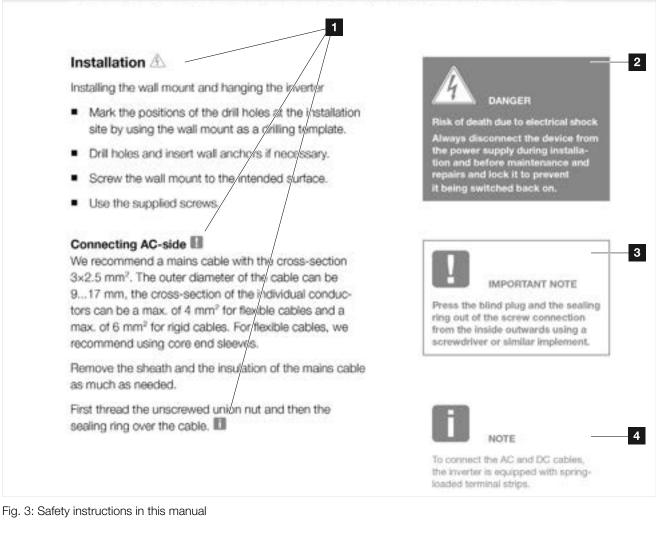
You can navigate to the referenced points in the document within the instruction text using the cross-references.

🔽 Ch. 1

🖬 Ch. 1, lt. 2

Fig. 2: Examples of cross-references

1.3 Notes in this manual



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

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.



The inverter may only be installed, 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.



INFO

This is additional information.

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

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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, KOS-TAL 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.



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 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.



The following systems are supported: Windows 10

2.3 The user interface

KOSTAL Solar Plan - 180214_1099.skoe File Extras Help				- D X
SOLAR ELECTRIC	1		2	KOSTAL
	3	4	5	
Smart connections.		Wechselrichtertypen PLENTICORE Plus PIKO IIA PIKO EPC PIKO FQ PIKO KQ PIKO FW >= 5.00 PIKO MP PIKO bewährte Generation	6	
	Page	hoose from one of the modes.		

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.
- Storage layout
 This selection undertakes complete planning of the inverter with additional storage system.
- Selection of the inverter groups to be considered in the planning.



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

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		
	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)		
Extra	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 KOSTAL Solar Plan		
Help	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

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			
(B)	Save project			
9	Print project			
Ð	Go to next page in project			
G	Go to previous page in project			

2.6 Entry of the user data

KOSTAL Solar Plan				- 🗆 X
File Extras Help				
PV modules	1			Landa and Andrews
SOL User data				KOSTAL
Program options internet updats	User data Contact person Street Country Phone Fax E-mail	DH Musterstr. 15 Germany +49 123 87654321 fax: Mustermann@kostal.com	Company Postcode / City Mobile Internet sile Company logo	Installation house 79103 Frietburg
	. Here	you can store your user deta		

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

I Est	Res Help						-		U.	0 =		80	1
OL	PV modules User data									D/2	ac		n
ou	Program options	1								LN3	05	ULAY	Ľ
_	internet update											_	-
6	W .	PV modules											
-	~ ~	Database		Standard	R	Search						100	ñ
100	88	Manufacturer	í	Designation	Rated p	ower Cell techn	vology	Favour	ttes			LD	ä.
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		15oftech Inc.	1 STH	210 Tile Red (11 / 2012	210 Wp	Polycrysta	line		-D	/	10		
		1Soltech Inc.	1 574-	220 Emerald Green (02	220 Wp	Polycrysta	line		/	XG			
		15oltech Inc.	1 STH	220 Emerald Green (11	220 Wp	Polycrysta	line	0/		XI	1		
		1Soltech Inc.	1 574-	220 poly (10 / 2011)	220 Wp	Polycrysta	2		10	XIS			
		1Soltech Inc.	1 574-	225 Forest Green (02 /	225 Wp	Polycrysta				XD	23	- 1	J.
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		Max. system voltage *		1000.00	v	Cell type *			Po	voystalline		10	ŝ.
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		MPP voltage STC *		32.20	0.5	MPP voltage ST	C (initia	0			0.00 V		
Smart	Sec. 1	MPP current STC *		1.77		MPP current ST	1000				A 00.0		
conne	ections.	open circuit voltage STC * Short-circuit current STC *		30.75		open circuit volt					0.00 V		
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		TC short-circuit current *			MAK E	TC open circuit					0 m	1000	5
		TK rated power *		-1250.00	(mining the	TC short-circuit		1.1.1.1.1.1			0 m		5
		The falles poreal		-12.30.84	laure la	TK rated power	(initial)		_		0.00 m/	0.000	4
								new		Reset	Can	cel	4

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

KOSTAL Solar Plan				- 🗆 X
File Estrats Help PV modules User data Program options	1		8	 = • • •
	Program options	k Drovi	Currency Module variance Database path Consider dynamic pe Consider dynamic per Consider dynamic per Consi	10
Smart connections.	Prany settings Adress Port	8000	User Password	Check prosy

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

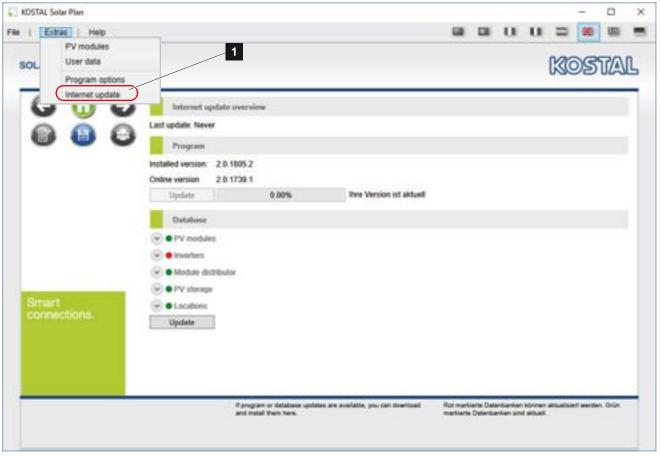


Fig. 11: Update

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

Pressing the "Update" button starts the update.



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

3. Use of KOSTAL Solar Plan

3.1	Creating a plan	 	

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.

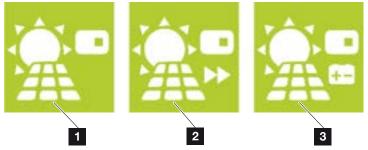


Fig. 12: Plan selection

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 2 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

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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.

4.2 Starting layout

LAR ELECTRIC	1			KOSTA
Location	Location	-a	Search	
Consumption	Project name		Latitude/Longitude	· · · P
PV generator	Country	Germany KO	City	(P
lever ter	Region	Baden-Würtlemberg	Ø PV module degression p.a.	0.00
Layout	City	Freiburg 🖸	Note	
String adjustment	Max. ambient temperature	26 🔡 10		
Califing	Irradiation cushing	0		
Yield	Min./Max. Module temperature	15 🔡 70 🔡 0		
000	Module temperature Lloc	4留10		
G 🕕 E	Netzspannung	230 🔛 V		
000	City	Freiburg	inadiation	1.192 KWh/m/a
	Latitude	47.9959 *	Longitude	7.8522 *
Smart	Ø Temperature	11 °C		
connections,	Customer data			
	Name		Prename	
	Street		Postcode / City	
	Country			
	Phone		Mobile	

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

DLAR ELECTRIC	1				KOSTA
Location	Location			Search	
Consumption	Project name			Latitude/Longitude	1.19
PV generator	Country	Germany	10	City	12
Investor	Region	Baden-Würtlemberg	10	Ø PV module degression p.a.	0.00
Layout	City	Aach	10	Note	
String adjustment	Max. ambient temperature		31 22.0	i i i i i i i i i i i i i i i i i i i	
Cabling	Irradiation cushing		0.000	c	
Yield	Min./Max. Module temperature		70 2000		
C	Module temperature Uoc		70 2000		
G 🛈 E	Netzspannung	1	30 V		
AAC	CN	Aach		irradiation	1.196 kWh/m*a
886	Latitude	47.8424 *		Longitude	8.8538 *
Smart.	Ø Temperature	9.c			
connections.	Customer data				
	Name	E.		Prename	
	Street	1		Postcode / City	
	Country	1		1. Prod. 3 PS - 12 C (2)	
	Phone			Mobile	
Aach, Germany	Here you	can enter the location and custo	inter 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

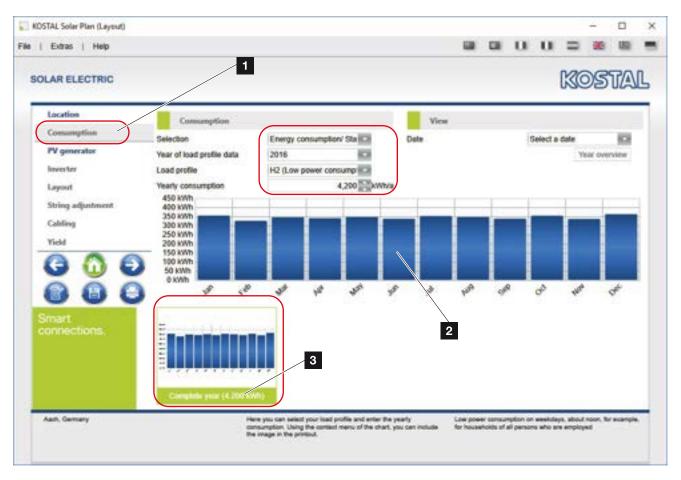


Fig. 16: PV project - Taking account of consumption

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

i Extras Help					= *	00
SOLAR ELECTRIC	1				KOS	TAL
Location Commption PV generator Inverter Layout String adjustment Cabling Yield	PV generator Generator Manufactur Generator 1 1Sottech in Generator 2 1Sottech in Generator 2 1Sottech in Name of PV generator Installation Manufacturer Number of PV modules Inclination	c. 1 STH-210 Til 4		0* 30	e Red (02 / 0	Ta kWp
Smart connections,	Designation	(02/2	Rafed DC power		210	Wp v
Aach, Germany Generator 1 & 40 kWp 40 x 15stlech Inc. 1 STH-210 Tile Indimeter: 30 ⁴ Alignment: 0 ⁴		e you can define the module arrays for your	installation.			

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

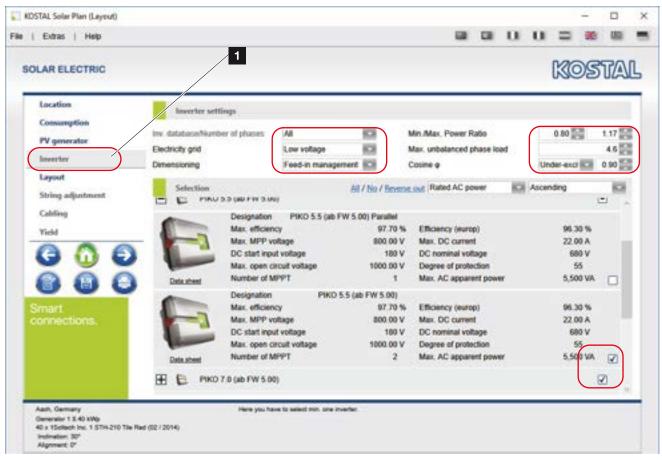


Fig. 17: PV project - Selecting inverter

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.



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 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.

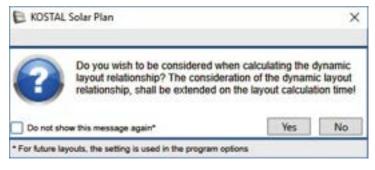


Fig. 18: Question - Dynamic layout ratio

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).

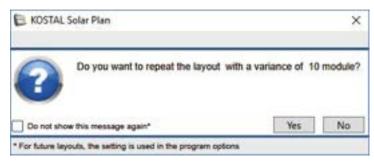


Fig. 19: Question - Module variance

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



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

(OSTAL Solar Plan (Layout) Extras Help						u	u		-	88	•
OLAR ELECTRIC								K	95	TA	L
Location	Layout			-	-	-	-	-	-	-	
Consumption	Pes. String configuration	Ster	og configuration	1		String	config	uration		4	1
PV generator	2 x PiKO 7.0 (ab FW 5.00) (1x9		(ab FW 5.00) Parallel (-							1
Inverter	2 x PIKO 7.0 (ab FW 5.00) (1x2)	0/1. 1xPIK0 5.5	(ab FW 5.00) Parallel (
Lapad	1 x PIKO 7.0 (ab FW 5.00) (1x20	0/1. 1 x PIKO 7.0	(ab FW 5.00) (1x20 / 1.	1	x PIKC) 5.5 (a	b FW 5	.00) (1x	21/0		
String adjustment	1 x PIKO 7.0 (ab FW 5.00) (1x9)	/ tx. 1 x PIKO 7.0	(ab FW 5.00) (1x9 / 1x.	. 1	x PIKO	5.5 (a	b FW 5	00) Par	allei (
	2 x PIKO 5.5 (ab FW 5.00) (1x14	1/1 x PIKO 5.5	(ab FW 5.00) (1x12 / 1.								
Cabling	Number Inverter	PR IPV orne	rato Number of mov	Rate	d DC e	torto	I A	C power	1.1		2
Yield	2 PIKO 7.0 (ab FW 5.00)	0.97 General	and the second se			9 kWp	- 64	6.30	COLOR IN COLOR		1
G () E	1 PiKO 5.5 (ab FW 5.00) P	0.93 Genera	Apr 2 22		4.6	2 kWip		4.95	KW		
AAA											
Smart											
connections,	Total PV power Max. Apparent power	16.80 kWp 19.50 kWA	Number of modu Generator 1	ies.					40		
	AC power max.	17.55 KW	Generator 2						40		
	Power Ratio	0.95									
	Unbelanced phase load	0.0 kVA									
	Cosine p	0.90									
Freiburg, Germany Generator 1 8,40 kWp 40 x 15offacti Inc. 1 5714-210 Ti Indirection: 30 ¹	Select your preferred In Red (02 / 2014)	é layout	Pa	ana do	not use	peratei s	ornedi	an in case	of partic	shadow	

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.

4.8 Inverter rewiring

OLAR ELECTRIC						KO	STA	1
Location	String adjustment	/						1
Consumption	-	sym. m Number of M PR	PV generator N	umber of mo R	estriction	Rated DC (1.1	
PV generator	⊙ 2 2 2 PIKO 7.0 (a km)	PIKO 7 CB 0.9	7 Generator	29	100 %	6.09 kWp	e X	đ
Inverter	O 122 PIKO 5.5 (a	PIKO 5 99	3 Generator 2	22	100 %	4.62 KWp	e X	9
Lapost	O 1 2 PRO 5.5 (a .	P9KD 5. 0 99	Generator 2	22	100 %	4.62 kWp	e x	C
								-
String adjustment	MPPT String Modules P	Vigenerator U OC (-4*)	U MPP (15°C)	U MPP STC	I UM	PP (70°C)	11 max (7	and a
Califing		nerator 1 ICH 808.50 V	621.00 V	600.00		505.50 V	7.13	
Yield	B 122 922 Ge	nerator 2 Kai 363.83 V C	330.00-) 279.45 V	330 00-1 270 00	V (309.00	>) 227 48 V	7,13	A
G 0 6								_
		AL 23 1991	120%					3
B B E	Total PV power Max. apparent power	21.42 kWp 25.00 kVA						
Courses.	Max. AC power	22.50 KW	2	-	+		-	-
Smart connections.	Power ratio	0.95	N OD N		-	-	-	
	Dyn. performance	1.00	1					
	Unbalanced phase load	0.0 KVA	"Boy see	4307 4807 53	ov serv e	NOV 680V	730V 780V	
	Cosine p	0.90		4	DC M			
					A Course in	Ainet		
	Number of modules	45		diere di subse	the states at	a constant of the		

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.



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

						0		=		-
SOLAR ELECTRIC							[KOS	STA	ſL
Location	Cabling									1
Consumption	POS Num	ber inve	erter PR	PV Generator	Numbe	r of PV	Rated [DC power		ī.
PV generator	•	2 PIKO 7.0 (J		Denerator 1; Generator	2	29		6.09 KWp		
linverter	0	2 P960 5.5 (J	ab FW 5.00) 0.93 (Senerator 2		22		4.62 kWp		
Layout										
String adjustment										
Califing										
Yield					-			_	4	
-	-		DC 1 (2i)		-1	AC	(3x)	-	-	
			10.0 m		-		10.0 1	0	A	
6 6 6		- E	4.00 mm* K2			2.50 mn			<u>P</u>	
						Copper)		
			Copper IICII							
Smart		CANADA DA ANA ANA ANA ANA ANA ANA ANA ANA		AC Visita	ne drop	0	15			
000		DC 1 voltage drop DC 1 power loss	0.2% 43W	AC Volta AC powe			3% 4W			
Smart		DC 1 voltage drop	0.2%		r loss	7				
Smart		DC 1 voltage drop DC 1 power loss	0.2% 43W	AC powe	r loss	7	4 W			
Smart		DC 1 voltage drop DC 1 power loss	0.2% 43W	AC powe	r loss	7	4 W			
Smart		DC 1 voltage drop DC 1 power loss	0.2% 43W	AC powe	r loss	7	4 W			

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.

4.10 PV system yield

			MORTA
LAR ELECTRIC			KOSTA
Location	Economic efficiency		
Consumption	Period of remuneration	20 E Years	
PV generator	Remuneration injection	15.00 ct AWh	Power feed
Inverter	Electricity costs	25.00 at AWh	
Layout	Energy costs increase p.a.	0.00 55 %	
String adjustment	Self consumption manual Car	9 m N	
Cabling	Degree of self consumpti ICH	52 %	Degree of self
	_		
Yield	Overview		
G 🙆 E	Number Inverter	Ø Annual yield Specific yield Performance Ra	
000	2 PIKO 7.0 (ab FW 5.00)	6,937 kWh/a 1,139 kWh/k	79 % 6.30 KW
888	2 PIKO 5.5 (ab FW 5.00)	5,298 kWh/a 1,147 kWh/k	79 % 4.95 KW
imart	Total PV power	21.42 KWp Self consumption manual	9%
onnections,	Total AC power	25.00 KW Degree of self consumption	auto. 52 %
	Transmission losses	159.90 kWh/a Payment	3,340 € /a
	Performance ratio total	0.95 Total payment	65,500 €
	Total Performance Ratio	79 % Power savings	1,932 kWh
	Specific yield	1,142 KWh/KWpla @ Savings in electricity cost	
20.00 A	Present Care	the effective of the standard and the	

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.



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

	Al; Solar Pten				-		x							
						÷.		-	0	x	1			
									-	^	-	 -		
											-	×		
	BOLAR ILECTING	0.00	LATES										-	
			A 100 100 100 100 100 100 100 100 100 10											
	Priject name:		1/13											
	Location	- Energy - Control - Contr												
	Ceerthry City	Germany Froburg												
	Longitude	7.8522 *												
	Latitude	47.9999 *												
	Irradiation	1192 kWh/m ² a												
	Average temp.	11 *C												
	Note													
	Contonner data													
	Name Prename													
	Street													
	Pestoode / City													
	Country													
	Phone			_										
	Mobile													
	Fax													
	t-mail													
	Contact person Company Country	int Industrian Association Sectory Constant Association (Constant Sector) 3.2.1488.3 March Association (Constant Association (Constant) Association (Constant) Association Association												
- 	кара III	101 + b	ent PDF +											

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.

5. Rapid inverter layout

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. 25: Rapid inverter layout button

Press the "Rapid inverter layout" button.

5.2 Starting rapid layout

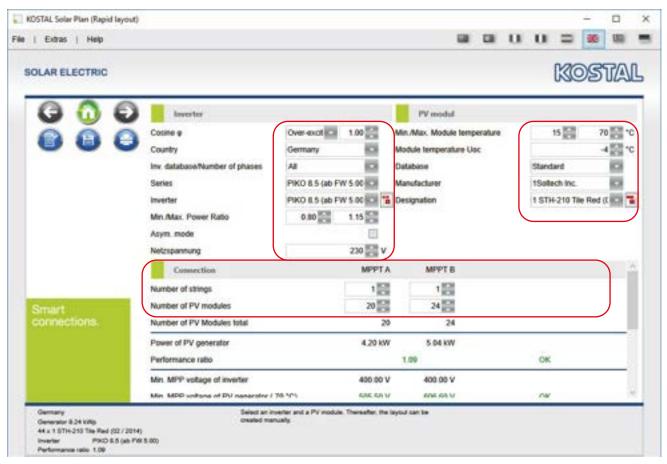


Fig. 26: Rapid Layout

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.

6. Inverter storage layout

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6.4	Selecting battery storage	49

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.

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
- 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



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

6.3 Selecting battery inverter

	100		
SOLAR ELECTRIC		DSTAL	
Location Consumption PV generator	Number of phases All I Min. Max. Power Ratio 0.80 22	148	
invertiar	Electricity grid Low votage Max. unbalanced phase load Dimensioning Feed-in management Cosine p Under-excit	44 22	
Layout String adjustment	Selection All / Itu / Reveal Out Raved AC power 🔛 Ascending		
Sharage Cabling Yield	PLENTICORE plus Designation PLENTICORE plus 3.0 Battery ins. (opt.) BI 5.525. BI 10/2		
	Max. open circuit voltage 1000.00 V Degree of protection 60 Number of MPPT 3 Max. 4C accessed power 3,000	SA OV S	
Enert	Designation PLENTICORE plus 3.0 Max. efficiency (surop) 96.21 Max. MPP votage 720.00 V Max. DC current 32.5	0.4 0.V 5	
	Designation PLENTICORE plus 4.2 Battery Inc. (opl.) BI 5.5/26, BI 10/27 Max. efficiency BI7.10 % Efficiency (surop) 96.27 Max. MPP voltage 720.00 V Max. DC (unren) 48.77	0.%	

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.

6.4 Selecting battery storage

					10	
1	SOLAR ELECTRIC					KOSTAL
1	Location	Selection				
	Consumption PV generator	81.	YD Durage			
	Frigenerer Inverter Layout String adjustment Storage		Discription Number of units Depth of discharge (DOD) Nominal Votage Autority Full cycles	Battery-Box Premium HVS 5.1 2 95 % 204 V 27 % 104	Total energy content Number of cycles Max. apparent power IP protection class Self consumption	2.1 KWN 2.7 KW 50 87 %
	Cabley Yell	Constant	Discription Number of units Depth of discharge (DOD) Nominar Votage Autarky Full cycles	Battery-Box Premium HV3 7.7 3 95 % 307 V 27 % 88	Total energy content Number of cycles Max, apparent power IP protection class Self consumption	7,7 kWm 4,0 kW 56 80 %
			Discription Number of units Depth of discharge (DOD) Nominal Votage Autarky Full cycles	Battery-Box Premium HVS 10.2 4 95 % 409 V 27 % 75	Total energy content Number of cycles Max. apparent power IP protection class Bell consumption	10.2 KW 5.3 KW 55 10 %
	Servert operations		Discription Number of units Depth of discharge (DOD) Nominal Voltage	Batery-Box Premium HVS 12.8 8 95 % 512 V 70 P	Total energy content Number of cycles Max. apparent power IP protection class	12.8 xWm 5.3 xW 55

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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Smart connections.