# Mounting systems for solar technology





# K2 SYSTEMS INSTRUCTION MANUAL K2 BASE

GB

# TABLE OF CONTENTS

TABLE OF CONTENTS	2
1. PROGRAMME INTRODUCTION	3
2. SYSTEM REQUIREMENTS	3
3. INSTALLATION / REMOVAL	3
START OF PROGRAMM	3
4. SELECTION OF ROOF TYPES	4
5. UPDATES	4
6. BASIC FEATURES	5
7. MAIN FEATURES SLOPED ROOF	6
7.1. INFORMATION	6 - 7
7.2. BUILDING PARAMETERS	8 - 9
7.3. DETERMINATION OF LOAD	10 - 12
7.4. EXPOSED LOCATION	12
7.5. ROOF CONSTRUCTION	13
7.5.1. Module installation	13 - 14
7.5.2. Exclusion areas	14
7.5.3. Additional function: roof structure	14 - 16
7.6. RESULTS	17 - 19
7.7. PARTS LIST	19
7.8. ASSEMBLY HELP	20 - 21
8. MAIN FEATURES FLAT ROOF	21
8.1. INFORMATION	21
8.2. BUILDING PARAMETERS	22
8.3. DETERMINATION OF LOAD	23
8.4. OPEN SITE	23
8.5. ROOF CONSTRUCTION	23
8.5.1. Module assembly	24 - 25
8.5.2. Exclusion areas	26
8.5.3. Additional function: roof structure	26 - 27
8.6. RESULTS	28 - 30
8.7. PARTS LIST	30
8.8. ASSEMBLY HELP	31
9. CONTACT	32
10. TERMS OF USE	32
11. CONDITIONS OF USE	33
	1

Content

## **1. PROGRAMME PRESENTATION**

K2 Base is a calculation and planning programme for the dimensioning of the substructure of photovoltaic systems, specially designed by K2 Systems. With the aid of the static calculation base, flat roofs and sloped roofs can be calculated and structurally determined in a very short period of time. The calculations are based on the national Appendixes of the Eurocode. Please note that the tool will provide you with verifiable structural calculations in printed form and thus all relevant data must be determined and/or entered.

# 2. SYSTEM REQUIREMENTS

The following requirements must be met for the software to work optimally:

- Operating System: Microsoft Windows XP or later
- ¬ Memory size: Min 1 GB RAM
- ¬ Disk space available: 100 MB
- Graphics: Open GL support
- ¬ Internet access

#### 3. INSTALLATION

K2 base can be installed via the following link: <u>http://</u> data.k2-systems.de/Downloads/K2SystemsSetup. <u>zip</u>. Please contact your administrator if this link is blocked. Save the programme onto your hard drive and then unpack it. You can use, WinZip or WinRAR (for



example) to extract the files. After installation, please follow further instructions. During installation you will be prompted to enter a password which will be made available to you by the K2 system. By clicking on the key, the password is confirmed.

#### UNINSTALL

To permanently delete the K2 Base software it must be uninstalled under **software** in the **control panel**. For Windows users the control panel can be found via the **<u>start button</u>** in the task bar and then **<u>settings</u>**.



### 4. SELECTION OF ROOF TYPES



Once you have started K2 Base, the window to the left will open. Before you can begin the calculation, you must choose the roof type. By clicking on the icon **pitched or flat roof**, you will be directed to the appropriate area.

Via the icon **Internet Update** you can download updates or new versions of K2 Base (see page 4).

#### 5. UPDATES

K2 SYSTEMS

K2 Update

Deck for up in the

KZ SYSTEMS

todates installed mattershipy Radamber installed soundship

Clerk for califier

UPDATE

The K2 Base software is continually developed. You will automatically be notified by email when a new update is available.

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K2 SYSTEMS UPDATE	Mounting systems for solar technology
1944 - S. 197	Same Same
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Callery	Address scale annotati

in the second second

Simply click on the "Internet update" button on the K2 Base start page or on the red K2 logo at the top left directly in the programme to open the update window. You can then search for updates. Additionally, you will receive information about the last update on this page. Automatic updates can be requested via the Options menu.

To update K2 Base, click on "Search for updates" and then on "Install updates".



Once the update has been completed, K2 Base can be started as always by double-clicking the desktop icon.







## 6. BASIC FUNCTIONS

Before using the software it is essential to make sure that projects are calculated with the latest version of K2 Base. We are not liable for calculations with the older version.



The following basic programme functions are either on the top task bar or can be accessed with one click on the **K2 button**:

- ¬ New project: A new project is started
- ¬ Open project: Open a previously saved project
- ¬<u>Open XML project:</u> Open a previously created project (e.g. in PV\*SOL) as XML-file
- ¬ Save project: Save an existing project
- Print preview: This option provides a multi-page overview of project details, verifiable statics, item listing and installation aid, which can also be saved as a PDF document
- ¬ Print: Print the calculated project
- ¬ Exit: Exits the programme (alternatively: Exit via X or double click the K2 button)



Additionally, the version number can be queried via the **<u>questions mark</u>** in the upper right corner of your screen. (Example: Version: 1.1.11.2)



The adjacent symbol will take you back to the home screen.



The arrow symbol reverses the last change.

# 7. MAIN FUNCTIONS SLOPED ROOF

The sloped roof function is intended to simplify and serve as a calculation basis for parallel assembled sloped roof systems. It is divided into several main functions, which take you through the programme step by step from the basic information to the assembly aid. The individual steps are selected by clicking on the top bar and are explained in the following.

|--|

#### 7.1. Information

All important project and Client data is entered via this main function.

🔊 🖉 🖸 🚱 🖬 🤅	1& <u>@</u> -)+	Unbenannt.k2s - K2	ESloped roof systems		
Information	Building Dimension Load Calculation	Exposed Location	Roof Structure Results	Bill Of Material annt - X	
Draftsman	Customer	Language Co	Project Sub	division	
Project Data					
Project Name			Project Address		
Protect Number					
ustomer			and the second sec	General	
Name	Name		Telephone	Telephone	
Contact Person	Contact Person		Telefax	Telefax	
Address	Address		Email	Emai	
Selvery Address					
C Project Address					
Customer Address					
@ Other					
an ale					

**D**. .

🚖 Select			
Idreis List		Transielland	2
Name		Name	
Contact Person		Contact Person	
Address	3	Address	
Telephone	3	Telephone	
Telefax	9	Telefax	
Email	8	Enal	
Discount			10,00 %
Standard User		13	

Under **<u>Edit</u>** certain client details and discount rates can be stored; they can be called up via **<u>Select</u>**.

New clients can be entered by clicking on the <u>**new**</u> <u>**document**</u>, and existing client data can be deleted via <u>**delete**</u>.

For the default user, the check box in the field below can be ticked.





	Germany
	France
	Italia
5	Spain
	Great Britain
	Belgium
$\blacksquare$	Austria
	Switzerland
$\odot$	Europe (Eurocode)
	Australia
<b>**</b> **	New Zealand
٠	Japan

🔁 Sub-project	unnamed 🔹 🗙					
Add new sub-project						
🚵 Load sub-project from file						
Project subdivision						

In addition, country-specific information is entered in the fields "Language" and "Country". The country entered serves as the basis for calculation, as compliance with the different standards and regulations of each country is necessary.

The following language settings are available: German, English, French, Italian and Spanish

On the left-hand side please select a country to access the country-specific load assumptions with corresponding stored calculation bases (including load maps for snow and wind).

In addition, the option **"Europe (Eurocode)"** serves as a calculation base in accordance with the Eurocode for dimensioning and calculations for countries not specified in the system. However, this does not replace a certifiable static.

Using the project subdivision, roof areas with different roof pitches (e.g. for roof gables) can be marked as sub-projects. Users are able to switch between individual sub-areas throughout the calculation.

Once the calculation has been completed, it is possible to select the print preview including the parts list of a sub-area or the entire project.



"Print all as PDF" and "Select sub-project" s also available in the quick access bar at the top of the screen.





#### 7.2. Building parameters

In this field, all significant information regarding the roof construction and building dimensions is requested.



Under **roof types** the appropriate roof shape can be selected from four different roof types.

Thereafter, the roof pitch over the eaves or the eaves and gables for hipped roofs, is entered. The graphics at the bottom of the page are adjusted automatically.



First, **length, width and height** dimensions of the building must be entered. Alternatively, for panel and gable roofs, the gable board length is used instead of the height. The remaining dimensions are determined by the roof pitch which is entered later. The parameters can be selected and changed by direct clicking (e.g. 12.00m) or entered.



Zoom out

In the next step, the **<u>roof covering</u>** is chosen. The adjoining types are available:

Additionally, in this field, the view can be increased or decreased via the **<u>zoom feature</u>**. By pressing the right mouse button, the image can also be moved.







Roof beams are displayed depending on the type of roofing. Enter spacing and number of either rafters or purlins. It is sufficient to provide the value for either one of these entries, because the second value is calculated automatically via the roof parameters. Additional entries are needed for tiled and slate roofs, with the former requiring batten spacing and the latter shingle dimensions.

As verge rafters often occur in practice, spacing between the first two and the last two rafters can be entered separately. In this case, following the entry, the rafter spacing is to be rechecked for possible averaging.

If a trapezoidal sheet is used, an additional field is displayed where information on corrugation pitch, thickness and material-specific tensile strength of the sheet is to be provided. Both inputs are required. For corrugated eternit, the distance between loops must be entered. When using SolarFasteners or Rafter Screws with a general technical approval more details about the roof's substructure have to be entered in an additional tab. The usage of either an universal sealing element (FZD; for corrugations) or storm washer (CAL; for trapezoidal sheets) has to be determined. To choose the right storm washer the crest width has to be entered. For SolarFasteners on corrugated fibre cement please choose the FZD.



#### 7.3. Load calculation

In the third main function of the sloped roof module the project location, with the associated wind and snow loads is determined.



The values for snow and wind loads can be entered or calculated in two different ways:

1. Manual input:

By clicking on **wind or snow load**, the corresponding load zone can be entered manually. The graphics at the bottom of the page serve as a guide.

2. Direct input:

If the values are known, they can be entered in the fields <u>direct value</u> in kN/m2. Important: Please note environmental conditions. For snow loads, the Si value (snow load on roof) must be entered.

The ground level (height above sea level) value is mandatory to calculate the load assumptions and has to be entered manually. An error message appears if missed.

FEATURE				6						₩. *	¥.	•
Input via postal code: When clicking on the postal code, either the <b>postal</b> <b>code</b> or the place name can be entered. The wind and snow loads are automatically detected and entered. For Japan the loads can only be determined by entering either the prefecture, county or city.	✓						✓					✓
Terrain category: Sea or lakeside Rural area Urban area		✓	✓	✓	✓	✓	✓	~	✓	✓	✓	~
Distance to the coast: Distance to shoreline 0,0 km			✓		✓							
Wind speeds:   Wind velocity 0,0 m/s					✓	$\checkmark$	~		✓			
Environment: Restricted area Normal area Protected area			✓					~	✓	✓	~	
Exceptional loads: North German Plain Direct value 0,000 kN/m <sup>2</sup> Exceptional loads The value is calculated auto- matically based on the load zones entered previously. When entering a postal code, this box is ticked automati- cally.	•	✓							✓			
Derive the reference value from the wind load map.								✓				
A height of cliff/steep front can be activated for pro- jects next to a cliff edge. An input between 0 and 50m is possible.								✓				



FEATURE		6			₩. *	業	•
Anti-slip device (e.g. snow guard)				✓			
Determine a <b>danger</b> <b>potential</b> of an installation via the importance level					~	~	✓
For the given radius a sea rate has to be determined (0 = no sea, 1 = 100% sea). Furthermore an input of the average snow load in N/m2/ cm is necessary. Sea rate (R = 20 km) 0,00 Ø unit load of snow 20,0 N/m <sup>2</sup> /cm							✓
The horizontal seismic load is shown for information only and can't be changed.							$\checkmark$

#### 7.4. Exposed location



This main function is only relevant for projects on hillsides. Should the system be located in a flat or shielded terrain, then one can continue with the next step of roof construction, with the default **no exposed location**.

For projects located on a hilltop, the following dimensions must be entered additionally:

Lengths: Lu; Ld

Height: H

Spacing: X

In the case of cliffs, only the values for Lu, H and X need to be entered.

The input parameter can be found in the graphics illustrated below.

With the country option Australia tick the box when the project is actually in Tasmania.

Lee Zone	$\checkmark$
Distance to ridge	0,0 km

Tasmania

Tick the box when the project is in a New Zealand lee zone. Additionally enter the distance to the mountain ridge.



#### 7.5. Roof construction



In the feature Roof construction gathers all important data concerning on-roof module assembly.

#### 7.5.1. Module installations

Module Type			O User Defined		
Tak 👔			Module Length		1.660 mm
Nerofactory	Ale	¢	Monhules Would's		990 mm
Model	51	-	Mushale Height		50,0 mm
			Mushile Weight		21,0 kp
			Duput		250 W
			(B France	(1) Thin Film	
Installation Instruction	ns -				
Manually	Rova	2	In the centre of the roof	· · · · · ·	🗇 No
	Modules Per Row	2			
🖒 Whole Roof With Border		0,00 m			
Module Middle Clamp T	ype				
		•			
Module End Clamp Typ	e		2		
-		*			
Thermal Expansion Par	rameters				
[2] Accept Default V	alues				
Hay, Perrentile R	allength	24,40 m			
Contraction Solution	Adth	60 mm			

In the first step, the modules are installed. By clicking on the appropriate icon the adjacent display appears:

The modules can either be selected from a predefined list, or user-defined.

Under **<u>edit</u>**, modules can be added to the list or deleted.

The module performance is only required to calculate the overall performance. This is not relevant for the dimensioning of the modules on the roof.

The modules can either be moved manually with X rows at Y modules, or an edge distance is defined.

The software will then try to place as many modules as possible onto the roof.

Under **module terminal type**, various middle and end clamps can be selected from. If these two fields remain blank, standard K2 clamps are used.

Due to the thermal expansion of the profiles the mounting rails and module springs need to be broken up. The max. rail series length and the joint width are preset.

Please note: If the preset lengths are changed or the hook is removed, K2 Systems accepts no liability for the project.

K2 Base Instruction Manual





#### 7.5.2. Exclusion areas



Туре	
Perpendicular To Roof Surface	
Perpendicular To Ground	
Dimensions	
Width	0,50 m
Length	0,50 m
Edge Distances	
Distance Left	5,75 m
Distance Right	5,75 m
Distance Top	2,06 m
Distance Bottom	2,06 m
	Ok Cancel

Often, it is not possible to cover the entire roof with modules therefore the programme offers the option of defining exclusion areas. Under <u>mark areas already</u> <u>in use</u>, the following window opens:

Under **type**, one can choose between vertically to the roof (roof window) or perpendicular to the floor plan (e.g. chimney). Thereafter the size of the exclusion area can be entered.

The position of the exclusion area is set by distances to the edges. Confirm with OK. and confirmed with OK.

By another click on the exclusion area object the input window can be accessed again to change size and distances. There is also an option to copy or delete the exclusion area.

#### 7.5.3. Additional function: roof structure



Alternatively, you can choose a single module per mouse click and delete using the delete key. Several modules can be selected by holding down the Ctrl key. Another option for selecting multiple modules is the key **mark panels**. This way several modules can be selected and deleted with the mouse.

module field is moved. In the case of several module fields, first select the appropriate field by clicking the check box and change the dimensions thereafter. If no module field is selected all fields are moved. Often, it is not possible to cover the entire roof with

When the field **module layout** is confirmed with OK, the modules are displayed as desired on the roof:

Please note that only the front roof area can be used.

Multiple module fields can be laid on a roof. Overlapping module fields are highlighted in yellow. By clicking on the margins, these can be newly defined and the

K2 Base Instruction Manual





Under **module orientation** the two types of installation, **standing** and **lying**, are differentiated. As a rule, for a tiled roof with rafters and for sheet metal roofs, the modules are mounted standing. In the case of purlin roofs, modules are generally mounted horizontally. Should the other installation type be required, a second rail (cross connection) is required. This can either be connected to the first rail with a cross connector or with the K2 Climber.

Choose a grid installation option (rails running exactly parallel to long edges of module) for sheet metal roof coverings by ticking the box with Add-Ons.



For corrugated fibre cement roof coverings and also for modules in landscape activate ,parallel to purlins'. A first layer of rails will then run parallel to the substructure (purlins).



Module assembly is discarded by clicking the **<u>recycle</u>** <u>**bin**</u>.



After changes have been made, the project can be updated by clicking on the **arrow** icon.



The magnifying **glass icon** offers the option to zoom all, zoom in or zoom out, as well as the option to magnify a defined area.

Alternatively, one can zoom with the mouse wheel when clicking into the graphics area.







The display in the graphic areas can be moved with the **<u>hand icon</u>**, or by holding down the right mouse button



Via the **rotation icon**, by holding down the left mouse button the building can be turned and be viewed differently from different angles.





With the command **<u>orig. rotation</u>** the view can be changed back to the original view.



The next main function is activated by clicking on **results**.

Should all required data not have been entered, an error message will appear. By clicking on OK, the appropriate main function, in which incomplete data was entered, is opened. After entering the missing data, one can click directly on the **results** tab.



#### 7.6. RESULTS



In this main function, the desired rails and fasteners are selected and their loads are calculated.

First, the a rail must be selected. By checking the boxes, the respective rails are activated. The upper rail position is chosen in cross bracing. All kinds of variations are displayed for the lower rail position.

6,10 m
4,20 m
2,10 m

Additionally, there is the option of a preferred rail length. Here you can choose between all types of rail lengths. Multiple entries are possible. Simply click the appropriate check box. The calculation is updated automatically.



Fasteners are selected by clicking on the appropriate icon. For tile roofs one can choose from various roof hooks, which differ for example in width or height. For corrugated Eternit roofs and trapezoidal sheet metal roofs, hanger bolts in different diameters and heights must be selected. For standing seam roofs, Kalzip and plate fold clamps made from aluminium and stainless steel are available. Only for Slate roofing and trapezoidal sheet metal roofs is no selection possible. Here the default fastener is selected automatically. On the right side of the display, the fastener spacing on ledges, rafters or purlins in the respective roof areas is specified. Please note that you must consider the respective material compatibility between the metals, etc., and determine the suitability yourself. The K2 Base does not differentiate e.g. copper or aluminium compatibility.





With the option ,Trapezoidal Sheet' the kind of threadforming screw can be chosen. The difference lies with the tip of the screws. Slowly move your mouse cursor over the screw types for relevant graphics to appear. When MiniRail was chosen previously this selection isn't available.



With the Roof Hook options (Tile, Flat Tiles) you can choose if the roof hooks may rest on the tiles. This is possible with tiles sturdy enough to not risk breaking, sheet metal tiles or similar, or if the gap between bracket and top of tile is more than 10mm.

Generally
Bottom Row
Three Module Rails

For higher loads or very heavy modules there is a possibility to include and calculate the system with a third module rail. With standing seam and trapezoidal sheet metal roofs please tick ,Generally' when every row shall have a third rail or tick ,Bottom Row' when only the bottom row towards the eaves shall have a third module rail. With the option ,Bottom Row' the distance between last module edge and eaves must not be more than 500mm. This option isn't available for corrugated fibre cement roof coverings.



	1.04	10000	this .		-
C (profile	(Constants)	TANK	NULTER .		100
Classifi In	Contracts	TATN	-40.144		-
				Protect website Protect website Minimum Minim	ter Rates Lines Lines V Adds V Adds Lines Lines Lines Lines Lines Lines Lines Lines

	×
Fastener	122,3 %

In the case of several selected rails and fasteners, the decision on which system to use can be based on load and price. The price is indicated as a system price in the tab **information** including the discount rate specified. The calculated load value will be displayed with the highest overall system value. If a single component is changed, everything changes. This could be e.g. a rail, a fastener or a screw connection. The individual values are shown on the right side of the screen. Should the load exceed 100%, the bar turns red, and when below 100% the bar is displayed in green.

The load value of the bottom rail is an exception, and this value is not included in the system load. Due to snow overhang, these components are more heavily loaded. If the load exceeds 100%, this is illustrated with a red X. It is therefore up to the installer whether he uses stronger fasteners for these areas, reduces the rail spacing or installs an additional rail. If all other loads are under 100% the system is still certifiable.

# 7.7. PARTS LIST

-	Later	have	Querta.	Asking UNI	Related to	No.	-	Criste This	Taxaet.	of the	Atla Donat	10.0
1	-	(Ciprellin					1,184	0,804	11.10%	4,424	4,22%	2,114
¥	ania	salesfurtherine (accounters from the automotion		- 38	6 (A	- 34	1.00%	1.01	SIN'S.	1.014	10.5	3331
8	1000	Cheville D. Allin	1		1 3	1.1	10.004	10,004	10.05	10,2004	1.01%	3,00
		strike Somehood for Something Life		1 10	1 ()	- 14	1.0014	1,007	2.07%	1,010	1.01%	100.8
8	20th	Cite SeeConsta 's tyre#ul		4	5 14		1444	1824	2.275	1,244	-4,81%	1.44
£	1010	Childheadorne (# lane		3	1.1	1.8	100.0	1,004	0.01%	1.000	1.0.%	3,04
Ť.	10.0	(Claimberlahove, Miller	1	1			1284	Line	225	1244	1.01%	11.71
3					1.19	a loge	11,18 kg	gaaran (			1.1.1.1.1	200
											18916	36.34
											dilater	2,01%
									- 044	erce Highe	etailue!	1.00%
										1.	Sec.545	10,344
											ur	23,81
										1	be blad	198.814





This main function displays a list of used items. Item number, designation, quantity, packaging unit, unit pieces, total quantity, weight, list price, discount rate, unit price, item discount and total price are indicated here. As a control, it is recommended to check the required quantities for plausibility.

With  $\underline{+ / -}$  , articles can be added or deleted by the articel number.

Under **quantity**, the required quantity can be changed. Weight and total price are updated in the process. In addition to the pre-determined discount rate, individual item discounts can be granted. There is also the option of project or prepayment discounts.

Several options are available for exporting the parts list:

- generate an Excel file and save
- if an e-mail programme is available, the order can be sent via PDF or Excel file
- Print order directly

In the case of several projects, the symbol can be used to display the total parts list.





# 7.8. ASSEMBLY HELP

The tab is initially hidden and appears only after clicking on **results**. The assembly instruction is supplemented by the assembly aid for visualisation of the project. However, K2 Base does not replace any assembly instructions of K2 Systems. K2 assembly instructions must be used and complied with!

Modules, roof areas, roof constructions, fasteners, rail connectors and SpeedLocks (only for SpeedRail System) can be displayed in this field. It is important to note that not all components can be displayed simultaneously.



By clicking on individual tracks, the rail lay out is illustrated in the top area of the screen. The entire parts list of tracks is displayed in the print preview.



An exception is the MiniRail system for there are only short rail sections used.

By clicking on one of the roof areas the relevant wind pressure coefficients are shown.





As described under "roof structure", the magnifying glass icon lets you zoom all, zoom in, zoom out or magnify an exact area. Alternatively, after clicking the graphics area, you can also zoom with the mouse scroll. With the hand icon, or by right-clicking the mouse, the display is moved into the graphics area.

# When finishing the project, it is advisable to check the data on the print preview and to save it as a PDF file. We also highly recommend saving the project as a \*.k2s-file for questions that may arise in the future.

#### 8. MAIN FEATURES COMPONENT FLAT ROOF

The flat roof feature is intended for simplification, as calculation basis and especially for determining of the ballasts for flat roof systems. Two systems are available. These differ in the orientation of the modules which are elevated in either single-sided or doublesided direction. Both systems are also divided into several main functions ranging from basic information to installation help.

#### 8.1. Information

See page 6 under 7.1. Information.



#### 8.2. Building parameters

In this field, all significant information regarding the roof construction and building dimensions is requested.



First, **length, width and height** dimensions of the building must be entered. The parameters can be selected and changed by direct clicking (e.g. 12.00m) or entered.

Eaves	0 °
Parapet wall he	0,20 m
Roofa	angle

Friction Coefficient	0,50
Friction	

Thereafter, a roof pitch between  $0^{\circ}$  and a maximum of  $5^{\circ}$  can be entered. If no angle is entered the default value of  $0^{\circ}$  applies.

In addition, the parapet height must be entered. The default value is 0.20 m.

In addition, a coefficient of friction must be entered. The default value is 0.5, which roughly corresponds to, which roughly corresponds to the friction coefficient for our Aluminium-coated protection mats on a roofing membrane. In comparison, the coefficient of friction between an aluminium rail and a wet building protection mat is 0.65. If a connection has If a non-penetrating flat roof system consists of more than one material transitions (e.g. Aluminium rail on building protection mat and building protection mat on membrane roof) the smaller value has to be used! (e.g. aluminium rail on building protection mat and building protection mat on foil roof), the lesser value must always be used!

Zoom out

Additionally, in this field, the view can be increased or decreased via the zoom feature. By pressing the right mouse button, the image can also be moved.



#### 8.3. Determination of load

See page 10 under 7.3 Load calculation.

#### 8.4. Open Site

See page 11 under 7.4 Exposed location.

#### 8.5. Roof construction

In the feature Roof construction gathers all important data concerning on-roof module assembly.

Module highlight infiguration used areas	discard Undo	2 Refresh	C Side C Rotation	Edge distance Highlight X Delete Machilee	Results		
Planning	Roof structure		30	Modules	Calcula		
							N
							w o
							rt.



By clicking on the icon with the points of the compass, the orientation of the building can be adjusted accordingly in 90° increments. This influences the orientation of the roof slope and therefore the row distance of South facing inclined systems.



#### 8.5.1. Module assembly

Module Type					
Pre-Defined			🕐 User Defined		
📷 Edit			Modulie Length		1.660 m
Manufacturer	Aleo	-	Module Width		990 m
Model	518	-	Mochule: Height		50,0 m
		1	Module Weight		21,0 k
			Output		230 y
			@ Framed	D This Pilm	
Installation Instruction	( <del>-</del>				
Manually	Rows	3	In the centre of the roof	O Yes	No No
	Modules Per Row	12	Distance Top		0,507
🔿 Whole Roof With	Border	0,50 m	Distance Left		0,50
Module Middle Clamp Ty	pe				
		•			
Module End Clamp Type					
1		-			
Thermal Expansion Par	ameters		System Type		
Max. length of the b	ase rais	18,30 m	O D-Level		
Joint width along the	base rais	468 mm	O D-Dome		
Max. length in direct	on of long sides of module	18,30 m	C S-Level		
Joint gap at thermal	separation between module arrays	50 mm	O S-Oome		
			Distance Between The Module Rows		1.743 mt
			Degree Of Latitude		52,0
			Manufacturer's Anneousl Guern?	W Yes	(C) No.

In the first step, the modules are installed. By clicking on the appropriate icon the adjacent display appears:

The modules can either be selected from a predefined list, or user-defined.

Under **<u>edit</u>**, modules can be added to the list or deleted.

The module performance is only required to calculate the overall performance. This is not relevant for the dimensioning of the modules on the roof.

The modules can either be moved manually with X rows at Y modules, or an edge distance is general defined. The software will then try to place as many modules as possible onto the roof. If the row/column design is put in manually, the array can be place central to the roof area or an edge distance top or edge distance left can be defined.

Under **module terminal type**, various middle and end clamps can be selected from. If these two fields

remain blank, standard K2 clamps are used.

Due to the thermal expansion of the profiles the mounting rails and module springs need to be broken up. The max. rail series length and the joint width are preset. The joint width is the distance from one end of one rail to the beginning of the next rail.

#### Please note: If the preset lengths are changed or the hook is removed, K2 Systems accepts no liability for the project.

In "System type", the double-sided elevation systems D-Level or D-Dome can be selected, and for systems where one side is elevated, the S-Level or S-Dome. When selecting the S-Level/S-Dome, the degree of latitude must be entered additionally for determination of row spacing. With D-Dome/S-Dome systems, it is necessary to enter whether clamping on the short side is approved by the manufacturer. The approval list can be viewed at www.k2-systems.com.

Different systems may not be combined on a roof.







K2 D-Dome (10°)



When the field module layout is confirmed with OK, the modules are displayed as desired on the roof:

Multiple module fields can be laid on a roof. Overlapping module fields are highlighted in yellow. By clicking on the margins, these can be newly defined and the module field is moved. In the case of several module fields, first select the appropriate field by clicking the check box and change the dimensions thereafter. If no module field is selected all fields are moved.

#### K2 S-Level (20°)



K2 S-Dome (10°)



#### 8.5.2. Exclusion areas

		Excluded Area
Туре		
Perpendicular To Roof Surface		
Perpendicular To Ground		
Dimensions		
Width		0 <mark>,</mark> 50 m
Length		0 <mark>,</mark> 50 m
Edge Distances		
Distance Left		5,75 m
Distance Right		5,75 m
Distance Top		2,06 m
Distance Bottom		2,06 m
	Ok	Cancel

Often, it is not possible to cover the entire roof with modules therefore the programme offers the option of defining exclusion areas. Under **mark areas already in use**, the following window opens:

Under **type**, one can choose between vertically to the roof (roof window) or perpendicular to the floor plan (e.g. chimney). Thereafter, the size of the exclusion area is set

With the edge distances the exclusion areas are defined and positioned on the roof. Confirm with OK.

By another click on the exclusion area object the input window can be accessed again to change size and distances. There is also an option to copy or delete the exclusion area.

#### 8.5.3. Additional function: roof structure

As an alternative to an exclusion area, you can choose a single module per mouse click and delete using the delete key. Several modules can be selected by holding down the Ctrl key.



.

Another option for selecting multiple modules is the key **mark panels**. This way several modules can be selected and deleted with the mouse.

3	10		
3	- 11	100.00	
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the second		12470	
the second second	- 11		
		10-24	

Module assembly is discarded by clicking the **<u>recycle</u>** <u>**bin**</u>.



After changes have been made, the project can be updated by clicking on the **arrow** icon.



The **magnifying glass icon** offers the option to zoom all, zoom in or zoom out, as well as the option to magnify a defined area.

Alternatively, one can zoom with the mouse wheel when clicking into the graphics area.







The display in the graphic areas can be moved with the **<u>hand icon</u>**, or by holding down the right mouse button



Via the **rotation icon**, by holding down the left mouse button the building can be turned and be viewed differently from different angles.





With the command **<u>orig. rotation</u>** the view can be changed back to the original view.



The next main function is activated by clicking on **results**.

Should all required data not have been entered, an error message will appear. By clicking on OK, the appropriate main function, in which incomplete data was entered, is opened. After entering the missing data, one can click directly on the **results** tab.





#### 8.6. Results

In this main function, the total load on the system is specified and the potentially required ballast is indicated. **Double-sided inclined systems:** 



The maximum load of the rail for the D-Level System is hereby calculated via the span, which can be found under "D-Level Set." Choose either ,max. distance' or ,distance according module grid pattern'. The ballast specified (per D-Level set) refers to the area between two D-Level sets. The corresponding roof areas, the exact dimensions of which are specified in the Assembly Aid, are displayed at the bottom right of the screen. The mounting rail K2 SolidRail Light is selected as default for this system.





For the D-Dome system, you can choose between module fastening using corner clamping (on the short side, with approval by the module manufacturer) or 1/4 clamping.

However, 1/4 clamping requires more rails and the additional FlexClamp.

In the case of the D-Dome system, the ballast value (in kg) refers to the projected surface below a double elevation, i.e. the area between two domes.



#### Single-sided inclined systems:

Additionally, with the S-Level system you can choose between the mounting rails K2 CrossRail 36 or 48. Due to the the windbreaker, the ballast (per S-Level set) for this system applies to the surface below an elevated solar module. The areas for ballasting are also displayed at the bottom right of the screen.

In the case of the S-Dome system, the ballast value (in kg) refers to the projected surface below a module, i.e. the area between two domes.

In addition, the D-Level and S-Level systems also offer an option for preferred rail length. Here you can choose between all kinds of rail lengths. Simply click on the desired length. Multiple entries are possible.



With a click you can choose between SpeedRail and FlatRail as base rails.

The selection of parquet layout/standard layout relates to the layout of the base rail in all four systems. In the case of parquet, the rail layout is optimised for cutting while the standard layout is optimised for easy installation. This feature is only available when there is one rail length as base rail is chosen.

K2 Base Instruction Manual



With both the double-sided as well as the single-sided systems the loads onto the module surface is given in kN/m2. It generally has to be confirmed that the module can withstand the given loads.

This is vital with our Dome systems for the PA-value (pascal) on the approved modules list might differ from the standard values by the manufacturers.

#### 8.7. Parts list

This main function displays a list of used items. Item number, designation, quantity, packaging unit, unit pieces, total quantity, weight, list price, discount rate, unit price, item discount and total price are indicated here.

os	Number	Name	Quantity	Packing Unit	Packing Unit Quantity	Total Amount	Weight	Catalog Price	Discount	Unit Price	Article Discount	Price
1	1001163	K2 SpeedRal 22; 6, 10 m	36	-1	36	36	140,544 kg	16,470 €	10,00 %	14,820 €	0,00 %	\$33,63
2	1006039	K2 connector SpeedRal/PlatRal Set	10	10	2	20	3,880 kg	2,490 €	10,00 %	2,241€	0,00 %	94,02
2	1005840	K2 Dome D 1000	90	1	90	90	117,000 kg	21,799 €	10,00 %	19,610 €	0,00 %	1764,99
÷	1005842	K2 Dome SD	180	1	180	180	\$7,600 kg	4,890 €	10,00 %	4,401€	0,00 %	792,18
5	1000 190	Hexagonal socket head cap screw DIN 912/DN ISO 476	360	200	2	400	5, 120 kg	0,070 €	10,00 %	0,063 €	0,00 %	25,20
6	100 1643	M K2 Slot nut with dip, Stainless steel	360	5	72	360	6,300 kg	0,590€	10,00 %	0,531€	0,00 %	191,16
7	1000473	Loding washer \$8, A2	360	200	2	400	0,200 kg	0,060 €	10,00 %	0,054€	0,00 %	21,60
8	1005149	K2 Set Middle Clamp, 49-50mm	290	- 1	280	280	22,680 kg	1,190 €	10,00 %	1,071€	0,00 %	299,88
9	1005172	K2 Set End Clamp 49-50mm	00	14	80	80	6,000 kg	1,240 €	10,00 %	1,116 €	0,00 %	89,28
					To	tal Weight	359,324 kg					
											Subtotal	3762,74
										Proje	ct Discount	0,00 %
									Adv	ance Payme	nt Discount	0,00 %
	1									1	Sum (Net)	3762,741
											TAV	714,92
										s	um (Gross)	4477,66

As a control, it is recommended to check the required quantities for plausibility.



With  $\underline{+ / -}$  , articles can be added or deleted by the articel number.

Under **quantity**, the required quantity can be changed. Weight and total price are updated in the process.

In addition to the pre-determined discount rate, individual item discounts can be granted. There is also the option of project or prepayment discounts.



Several options are available for exporting the parts list:

- generate an Excel file and save
- if an e-mail programme is available, the order can be sent via PDF or Excel file
- Print order directly





#### 8.8. Assembly help

The tab is initially hidden and appears only after clicking on **results**. The assembly instruction is supplemented by the assembly aid for visualisation of the project. However, K2 Base does not replace any assembly instructions of K2 Systems. K2 assembly instructions must be used and complied with!



Here modules, roof areas and rail connectors can be displayed. It is important to note that modules and rail connectors cannot be displayed simultaneously. If the roof areas are activated, their dimensions can be used for the exact dimensioning of the ballast.

By clicking on individual tracks or track pairs, the rail lay out is illustrated in the top area of the screen. The entire parts list of tracks is displayed in the print preview.

As already described under "roof structure", the magnifying glass icon lets you zoom all, zoom in, zoom out or magnify an exact area. Alternatively, after clicking the graphics area, you can zoom with the mouse scroll. With the hand icon, or by right-clicking the mouse, the display is moved into the graphics area.

When finishing the project, it is advisable to check the data on the print preview and to save it as a PDF file. We also highly recommend saving the project as a \*.k2s-file for questions that may arise in the future.



## 9. CONTACT

Should you experience any problems with the K2 Base software, please send an e-mail to base@k2-systems.de or contact the Service Hotline: **+49 (0)7159 42059-0**.

#### **10. TERMS AND CONDITIONS**

K2 Base may only be used after permission by K2 Systems has been granted. This is done by sending of a link for the download of the programme including the corresponding password. Before using the software it has to be checked that projects are calculated with the latest version. For calculations with older versions, no liability is accepted.

Our General Terms of Business apply. Please refer to http://www.k2-systems.uk.com/gsc.html German Law shall apply excluding the UN Convention on CISG. Place of venue is Stuttgart



# 11. CONDITIONS FOR THE USE OF THE K2 CALCULATION PROGRAMME K2 BASE

#### 1. General

- 1.1. The use of the K2 calculation programme K2 Base including the associated media, electronic manuals, documentations in online or electronic format and internet-based services (below referred to as "product") shall be permitted on the basis of the following Conditions of Use.
- 1.2. The use of the product is exclusively permitted to enterprises; consumers are not allowed to use it. Pursuant to § 13 BGB (German Civil Code), consumer refers to every natural person who concludes a legal transaction for a purpose that can neither be attributed to a commercial nor a freelance professional activity. Pursuant to § 14 BGB, enterprise refers to any natural or legal person or a partnership with legal capacity that acts, in the case of a conclusion of a legal transaction, in the exercise of the person's commercial or freelance professional activity.
- 1.3. The use of the product is free of charge; however, it shall be at the user's own risk. The selected proposals have to be checked thoroughly by the user or installer respectively before installing. The software functions and features as well as all data employed by the tool have been tested carefully by K2 systems GmbH and are updated regularly. Nevertheless mistakes or faults can't be ruled out. No responsibility is taken for the actuality, correctness and completeness of the employed specifications, data and calculations.
- 1.4. General Terms and Conditions (AGB) or General Purchase Conditions (AEB) of the user shall not be applicable. This shall also apply if reference is made to them in an item of correspondence or if the use of the product is permitted to the user in knowledge of his General Terms and Conditions or General Purchase Conditions.
- 1.5 Prior to the use of the software, it shall be verified that projects with the latest version of K2 Base are calculated. No liability shall be assumed for calculations with a previous version.

#### 2. Use of the Product and Restrictions for Use

- 2.1. The product will be provided to the user unless expressly stated otherwise free of charge.
- 2.2. For the use of the product, K2 grants the user the ordinary, at any time revocable, right to run the software on a computer. Particular note should be taken that the use of the product is limited to 3 months. After that, any further use of the product is only possible by entering an activation code that is updated every 3 months. The user shall have no right to claim receipt of the updated activation code. In addition, receipt of the updated activation code is subject to the previous acceptance of the current Conditions of Use. The user's lawful minimum rights of use shall remain unaffected. The terms set out in this section shall also bind the parties according to the law of obligations.
- 2.3. Every user must use the product for no other purposes than for information. Every other use or utilisation of the product as well as the information obtained from it, particularly the copying, changing or integrating it into publications or advertisements of any kind is subject to K2's prior approval or the relevant copyright holder.
- 2.4. The user must not sell, pass on as a gift, lend or rent out the product or parts of the product to a third party.
- 2.5. The user shall have no right to remove or omit the existing protection of the product especially the software against unauthorised use, unless this is necessary to achieve a trouble-free lawful use of the programme. Copyright notices, serial numbers as well as other programme identifications may neither be removed nor changed. The same shall apply to the suppression of the respective properties on the screen.

#### 3. Disclaimer of Warranties, Limitation of Liability

- 3.1. Any liability by K2 for defects of quality and/or title of the product, especially for the freedom of faults, freedom from property rights and copyrights held by third parties, completeness and/or usability as well as for potential consequences of a possible misinterpretation of the results obtained with the aid of the product by the user shall be excluded except for cases of gross negligence or intent by K2 or death or injury to the body and health as well as claims pursuant to the Product Liability Act.
- 3.2. For consequential damage, loss of profit, production loss, operational interruption or data loss, K2 shall not assume any liability – except for cases of gross negligence or intent as well as death or injury to the body or health and claims pursuant to the Product Liability Act.
- 3.3. K2 shall not be liable for damage that is attributable to the improper use of the product by the user. The user shall fully release K2 in this respect from any claims raised by third parties, including the costs of extrajudicial legal proceedings upon the first request.
- 3.4. It is the user's responsibility to provide the working environment for the software. K2 shall assume no warranty that the software meets the user's requirements and that it operates without any conflicts with the other software employed by the user and his hardware. The user shall take suitable precautions for the case that the software does not work properly as a whole or in part (e.g. by data backup, troubleshooting, regular verification of the results).

#### 4. Important Information about Computer Viruses and Data Protection

- 4.1. Although K2 takes every effort to keep the product virus-free, K2 cannot accept any guarantee or liability for the freedom from viruses. Any liability on the part of K2 for damage and disturbance caused by computer viruses shall be excluded.
- 4.2. Prior to downloading the product, particularly of the software, the user shall take suitable safety precautions and employ appropriate virus scanners to ensure a protection. Nevertheless, K2 recommends, before every installation, to carry out a data backup for existing, possibly important data for the case that the product does not operate properly in part or as a whole.
- 4.3. The user shall save data and programs in adequate intervals, at least once per day, in electronic form and, by doing this, ensure that they can be recovered at reasonable effort. In the case of a data loss, K2 shall be liable as a maximum for the damage as it would have occurred after a proper data backup by the customer.

#### 5. Contact Person for Queries

- 5.1. If you have any questions about these Conditions of Use or if you would like to get in touch with K2 for other reasons, please contact:
  - K2 Systems GmbH Industriestraße 18 71272 Renningen | Germany Email: base@k2-systems.de
- 5.2. You can visit us on the internet under www.k2-systems.de.

#### 6. Place of Jurisdiction / Governing Law

- 6.1. Place of jurisdiction is Stuttgart.
- 6.2. German law applies under exclusion of the rules of the Private International Law as well as the UN Purchase Law.

Renningen, 21 July 2014





Mounting systems for solar technology



# SERVICE-HOTLINE +49 (0)7159 42059-0 Info@k2-systems.de

Base Bedienungsanleitung | GB9 | 0615 | Subject to change. Product illustrations are exemplary illustrations and may differ fro Please refer to http://www.k2-systems.uk.com/downloads/certificates.html to download our quality and product certificates.