Mounting systems for solar technology

K2 SYSTEMS GMBH

CALCULATION BASIS

PROJECT: New project

AUTHOR: Arturs Gergelevics

DATE: 12/13/2021

PROJECT DATA

GENERAL INFORMATION

Name	New project
Mounting System	D-Dome 6.10 with Ballast and fixed anchors
Author	Arturs Gergelevics

LOCATION

Address	18. novembra iela 2, Daugavpils, LV-5401
Ground level	95.14 m
Roof type	Flat roof
Fastening method	with Ballast and fixed anchors
Roof covering	Flat
Building height	12.00 m
Parapet wall height	0.00 m
Roof pitch	4 °
Minimum Roof Edge distance	0.60 m
Material	Bitumen
Friction coefficient	1.00
Terrain category	III: Villages, suburbs, woodlands

To ensure proper ballast calculation, coefficient of friction to be verified by Designer or Installer. Refer to the technical information section of website for values on common roof types.

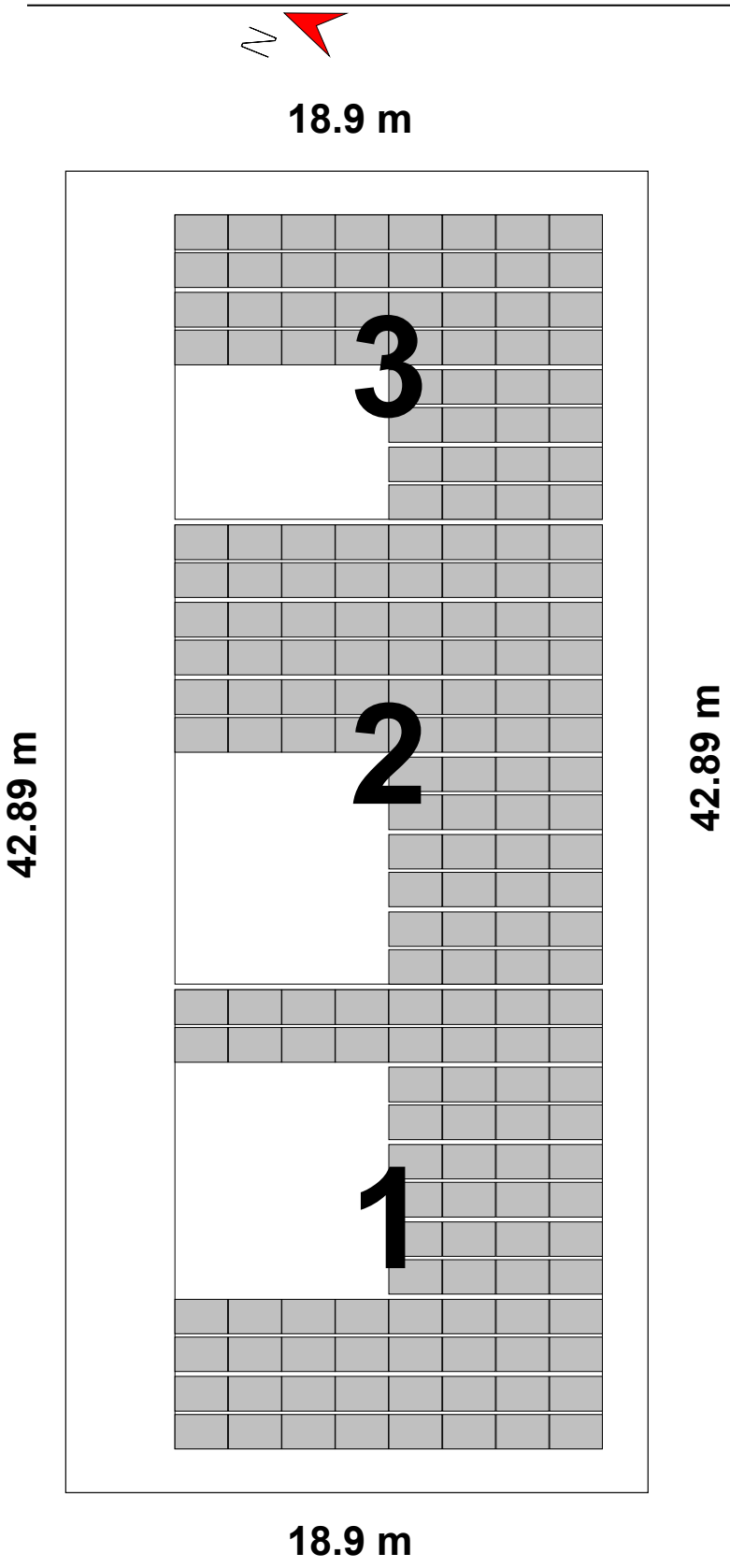
LOADS

Design method	Eurocode		
Failure consequence class	CC1	Design working life	25 years
velocity pressure	$q_{p,25}$= 0.464 kN/m²		
Snow load on ground level	s_k = 1.100 kN/m²		

MODULES

Manufacturer	Viessmann	Quantity	192
Name	Vitovolt 300-M400WE	Output	76.800 kWp
Dimensions LxWxH	1719 x 1140 x 35.00 mm		
Weight	22.0 kg		
Power	400 W		

ASSEMBLY PLAN



Dimensions in [m]

LEGEND

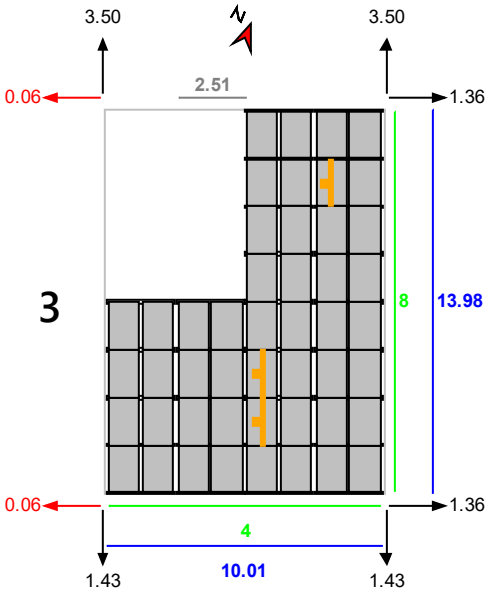
Distance to neighboring module array [m]

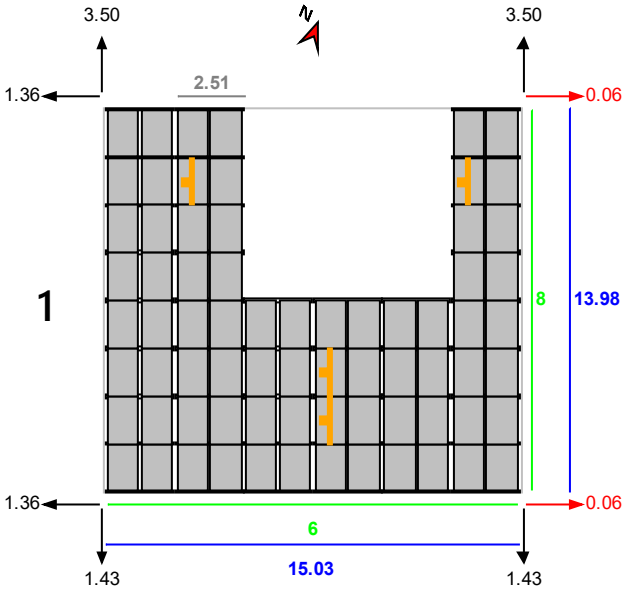
Distance to roof edge [m]

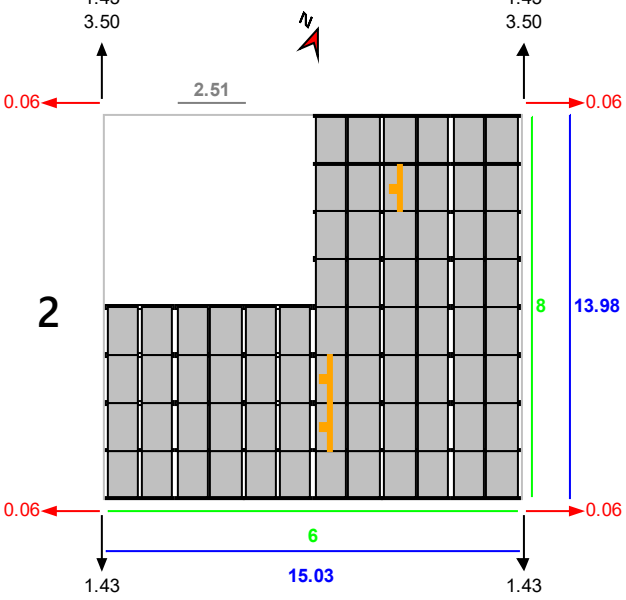
Module count

Length/width of module array [m]

Row distance [m]

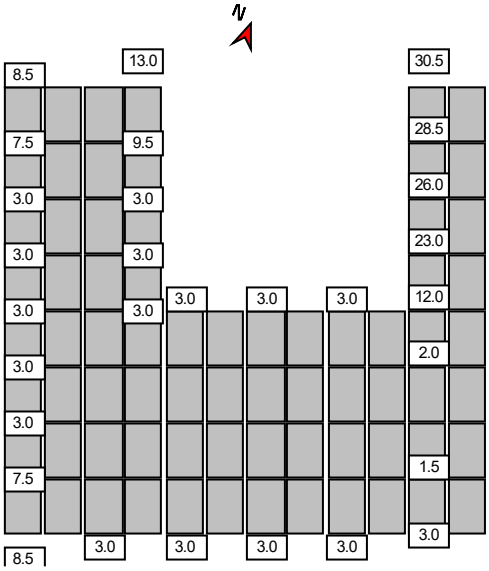






BALLAST PLAN

1



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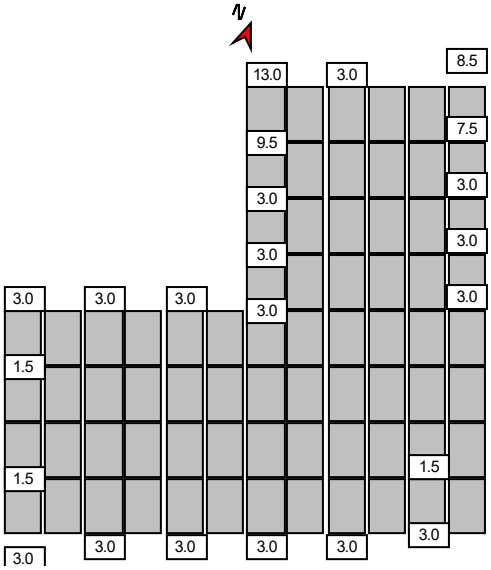

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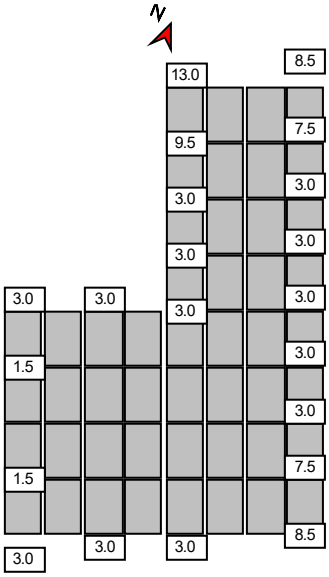

RESULTS

BALLAST CAPACITY

Speed Porter	40.0 kg
Porter	108.0 kg
module clamp	MiniClamp MC Set 30-50
end clamp	MiniClamp EC Set 30-50

RESISTANCE VALUES OF THE ANCHORS

Anchor	User defined anchor
Shear Capacity.	2.43 kN
Tensile Load Capacity.	1.63 kN

VERIFICATION SYSTEM UTILIZATION

Verification system utilization [%]	**pressure**	36.23
	suction	69.60
Loads on modules (ultimate state) [Pa]	**pressure**	1649
	suction	-544
Loads on modules (serviceability) [Pa]	**pressure**	1232
	suction	-375

SPECIFIC LOADS

Index (module block)	number of supports (module block)	--- ---	Ballast required [kg] (module block)	Dead weight [kg] (module block)	Dead Load [kN/m²] (module block)	Dead Load [kN/m²] (roof surface area)	Dead load [kN/m²]
module array 1	36	---	226.0	2054.8	0.13	---	---
module array 2	36	---	91.0	1919.8	0.12	---	---
module array 3	24	---	96.5	1315.7	0.13	---	---
all Blocks	**96**	---	**413.5**	**5290.3**	---	**0.06**	---

NOTES

- The proof of position safety and load capacity of the system are carried out by checking the load cases lifting and shifting by wind and by further static calculations. You will find a short version of the wind tunnel report and a certificate for the further static calculations on our homepage.
- The design rules comply with the EURO CODE EN 1990 - Basis of structural design.
- Service life is recognised according to 'Eurocode EN 1991 – Action on structures, Snow loads' and 'Eurocode EN 1991 – Actions on structures, Wind actions'. Subject to the Building Regulations and for security-relevant reasons the installation has to be dismantled at the end of its service life.
- Failure consequence class is considered according to 'Eurocode EN 1990 – Basis of structural design'.
- Data and results must be verified with regard to local conditions and checked by a suitably qualified person. Please see our TCU under https://k2-systems.com/en/base-tcu , in particular § 2 ("technical and specialist requirements for the customer"), § 7 ("warranty provisions") and § 8 ("limitation of liability").

⚠ The anchors are not part of the K2 products and must be purchased separately from the respective manufacturer.

STRUCTURAL ANALYSIS REPORT

GENERAL INFORMATION

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Friction coefficient	1.00
Terrain category	III: Villages, suburbs, woodlands

LOADS

Design method	Eurocode		
Failure consequence class	CC1	Design working life	25 years

Wind speed	v_b = 21.0 m/s
velocity pressure	$q_{p,50}$ = 0.504 kN/m²
Adjustment factor for service life	f_w = 0.921
velocity pressure	$q_{p,25}$ = 0.464 kN/m²

Environment	Normal area
Snow load on ground level	s_k = 1.100 kN/m²
Shape Coefficient for Snow	μ_i = 0.800
Factor for roof pitch	d_i = 0.998
Snow load on roof	$s_{i,50}$ = 0.878 kN/m²
Adjustment factor for service life	f_s = 0.929
Snow load on roof	$s_{i,25}$ = 0.816 kN/m²

DEAD LOAD

Weight module	G_M = 22.0 kg	Dead weight module	= 11.23 kg/m²
Weight mounting system	= 3.4 kg	Dead weight mounting system	= 0.87 kg/m²
Module area	A_M = 1.96 m²	Total Dead Weight (excl. ballast)	= 0.13 kN/m²

LOAD COMBINATIONS

LOAD-BEARING CAPACITY

Partial safety factor unfavorable permanent load	$\gamma_{G,sup}$	1.35
Partial safety factor favorable permanent load	$\gamma_{G,inf}$	1.00
Partial safety factor destabilising permanent load	$\gamma_{G,dst}$	1.10
Partial safety factor stabilising permanent load	$\gamma_{G,stb}$	0.90
Partial safety factor first variable load	γ_{Q}	1.50
Partial safety factor variable loads	γ_{Q}	1.50
Combination coefficient with regards to wind	$\psi_{0,W}$	0.60
Combination coefficient with regards to wind (additional varying influences)	$\psi_{1,W}$	0.20
Combination coefficient with regards to Snow	$\psi_{0,S}$	0.50
Importance factor variable	$\kappa_{Fl,Q}$	0.85
Characteristic dead weight	G_k	
Characteristic snow load on the roof	$S_{i,n}$	
Characteristic wind load	W_k	

Load case combination 00:	$E_d = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * S_{i,n}$
Load case combination 02:	$E_d = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,Pressure}$
Load case combination 03:	$E_d = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * (W_{k,Pressure} + \psi_{0,S} * S_{i,n})$
Load case combination 04:	$E_d = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * (S_{i,n} + \psi_{0,W} * W_{k,Pressure})$
Load case combination 06:	$E_d = \gamma_{G,inf} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,Uplift}$
Uplift Verification:	$E_d = \gamma_{G,stb} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,n,Uplift}$
Displacement verification:	$E_d = \gamma_{G,stb} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,n,Displacement}$

USABILITY

Combination coefficient with regards to wind	$\psi_{0,W}$	0.60
Combination coefficient with regards to Snow	$\psi_{0,S}$	0.50

Load case combination 00:	$E_d = G_k$
Load case combination 01:	$E_d = G_k + S_{i,n}$
Load case combination 02:	$E_d = G_k + W_{k,Pressure}$
Load case combination 03:	$E_d = G_k + W_{k,Pressure} + \psi_{0,S} * S_{i,n}$
Load case combination 04:	$E_d = G_k + S_{i,n} + \psi_{0,W} * W_{k,Pressure}$
Load case combination 06:	$E_d = G_k + W_{k,Uplift}$

THE SYSTEM HAS BEEN SUCCESSFULLY CALCULATED.