

EXAMPLE



Mounting systems for solar technology



K2 SYSTEMS GMBH
CALCULATION BASIS

PROJECT: New project
AUTHOR: Solar-nu.nl
DATE: 21/06/2017



PROJECT DATA

GENERAL INFORMATION

Name	New project
Mounting System	S-Dome Classic
Customer	Ton Verbakel
Contact	info@solar-nu.nl
Author	Solar-nu.nl

LOCATION

Address	Zernikestraat 7, 2665 JJ Bleiswijk, Netherlands
Ground elevation	0.00 m
Roof type	Flat roof
Building height	9.00 m
Parapet wall height	0.00 m
Roof pitch	0 °
Edge distance	0.60 m
Friction coefficient	0.50
Terrain category	III: Villages, suburbs, woodlands

The friction coefficients given here must be checked onsite. If a lower value is found, this must be specified here for the ballast calculation!

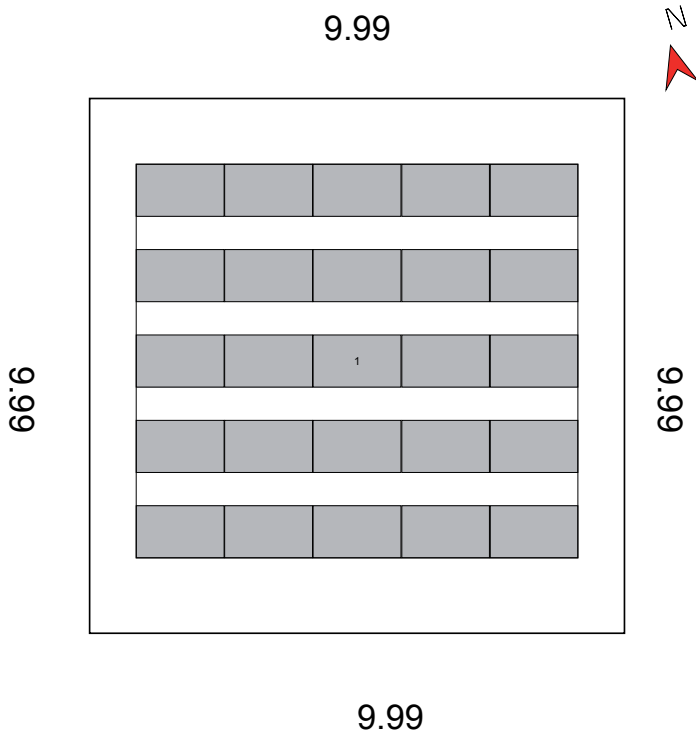
LOADS

Design method	Eurocode		
Failure consequence class (CC)	CC1	Service life	25 years
Peak velocity pressure	$q_{p,25} = 0.21 \text{ kN/m}^2$		
Snow load on ground level	$s_k = 10.00 \text{ kN/m}^2$		

MODULES

Manufacturer	Zonnepaneel	Quantity	25
Name	Benutzerdefiniert	Output power	7 kWp
dimensions LxWxH	1640 x 992 x 40.0 mm		
Weight	18.5 kg		
Output power	260 W		

ASSEMBLY PLAN



Dimensions in [m]



LEGEND

Distance to neighbouring module array [m]

Distance to roof edge [m]

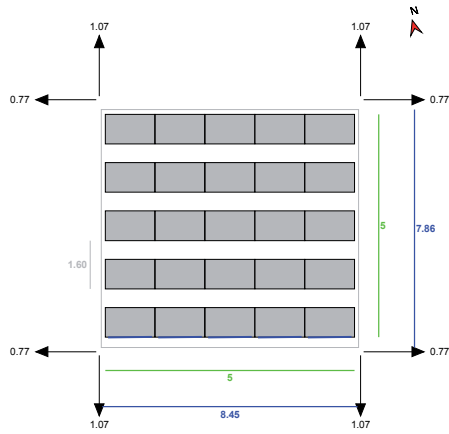
Number of modules

Length/width of module array [m]

Row distance [m]

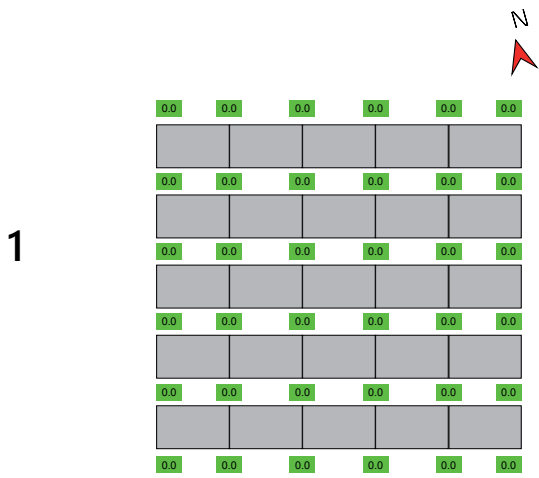
Installation of base rails in a staggered pattern (re-use of off-cuts)

1





BALLAST PLAN





RESULTS

BALLAST CAPACITY

Dome	5.0 kg	Rounding value	0.0 kg
Speed Porter	40.0 kg		
Porter	120.0 kg		

VERIFICATION SYSTEM UTILISATION

		Corner areas North	Corner areas South
Verification system utilisation [%]	pressure	183.30	182.70
	suction	8.63	6.33
Loads on modules [kN/m ²]	pressure	9.84	9.81
	suction	-0.07	-0.07

SPECIFIC LOADS

Index (module block)	No. of modules (module block)	Ballast [kg] (module block)	Dead weight [kg] (module block)	Dead Weight [kN/m ²] (module block)	Dead Weight [kN/m ²] (roof surface area)
module array 1	25	0.0	612.5	0.09	---
all Blocks	25	0.0	612.5	---	0.06

NOTES

- The design rules comply with the Eurocode EN 1990 - Basis of structural design.
- Service life is recognised according to 'DIN EN 1991 - Action on structures, Snow loads' and 'DIN 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 'DIN EN 1990 - Basis of structural design'.



STRUCTURAL ANALYSIS REPORT

GENERAL INFORMATION

Name	New project
Mounting System	S-Dome Classic
Customer	Ton Verbakel
Contact	info@solar-nu.nl
Author	Solar-nu.nl

LOCATION

Address	Zernikestraat 7, 2665 JJ Bleiswijk, Netherlands
Ground elevation	0.00 m
Roof type	Flat roof
Building height	9.00 m
Parapet wall height	0.00 m
Roof pitch	0 °
Edge distance	0.60 m
Friction coefficient	0.50
Terrain category	III: Villages, suburbs, woodlands

LOADS

Design method	Eurocode		
Failure consequence class (CC)	CC1	Service life	25 years
Wind speed	$v_b = 15.0 \text{ m/s}$		
Peak velocity pressure	$q_{p,50} = 0.23 \text{ kN/m}^2$		
Adjustment factor for service life	$f_w = 0.903$		
Peak velocity pressure	$q_{p,25} = 0.21 \text{ kN/m}^2$		
Environment	Normal terrain		
Snow load on ground level	$s_k = 10.00 \text{ kN/m}^2$		
Shape Coefficient for Snow	$\mu_i = 0.800$		
Snow load on roof	$s_{i,50} = 8.00 \text{ kN/m}^2$		
Adjustment factor for service life	$f_s = 0.929$		
Snow load on roof	$s_{i,25}$		



$$= 7.43 \text{ kN/m}^2$$

DEAD WEIGHT

Weight module	$G_M = 18.5 \text{ kg}$	Dead weight module	$= 11.37 \text{ kg/m}^2$
Weight mounting system	$= 6.0 \text{ kg}$	Dead weight mounting system	$= 3.69 \text{ kg/m}^2$
Module area	$A_M = 1.63 \text{ m}^2$	Dead Weight	$= 0.15 \text{ kN/m}^2$

LOAD COMBINATIONS

Partial safety factor unfavourable permanent load	$\gamma_{G,sup}$	1.35
Partial safety factor favourable permanent load	$\gamma_{G,inf}$	1.00
Partial safety factor destabilising permanent load	$\gamma_{G,dst}$	1.10
Partial safety factor stabilising permanent load	$\gamma_{G,stab}$	0.90
Partial safety factor first variable load	γ_{Q1}	1.50
Partial safety factor variable loads	γ_{Qn}	1.50
Partial safety factor exceptional load	γ_A	1.00
Combination coefficient with regards to wind	$\psi_{0,W}$	0.60
Combination coefficient with regards to Snow	$\psi_{0,S}$	0.50
Combination coefficient with regards to wind (additional varying influences)	$\psi_{1,W}$	0.20
Importance factor permanent	$\kappa_{FI,G}$	0.90
Importance factor variable	$\kappa_{FI,Q}$	0.85
Importance factor exceptional	$\kappa_{FI,A}$	0.80

Load Combination1:	$E_d = \gamma_{G,sup} * \kappa_{FI,G} * G_k + \gamma_Q * \kappa_{FI,Q} * S_{i,n}$
Load Combination2:	$E_d = \gamma_{G,sup} * \kappa_{FI,G} * G_k + \gamma_Q * \kappa_{FI,Q} * W_{k,Pressure}$
Load Combination3:	$E_d = \gamma_{G,sup} * \kappa_{FI,G} * G_k + \gamma_Q * \kappa_{FI,Q} * (W_{k,Pressure} + \psi_{0,S} * S_{i,n})$
Load Combination4:	$E_d = \gamma_{G,sup} * \kappa_{FI,G} * G_k + \gamma_Q * \kappa_{FI,Q} * (S_{i,n} + \psi_{0,W} * W_{k,Pressure})$
Load Combination5:	$E_d = \kappa_{FI,G} * G_k + \gamma_A * \kappa_{FI,A} * A_d + \kappa_{FI,Q} * \psi_{1,W} * W_{k,Pressure}$
Load Combination6:	$E_d = \gamma_{G,inf} * G_k + \gamma_Q * \kappa_{FI,Q} * W_{k,Suction}$
Uplift Verification:	$E_d = \gamma_{G,stab} * G_k + \gamma_Q * \kappa_{FI,Q} * W_{k,n,Uplift}$
Displacement verification:	$E_d = \gamma_{G,stab} * G_k + \gamma_Q * \kappa_{FI,Q} * W_{k,n,Displacement}$

BILL OF MATERIALS

Position	Item no.	Item description	Quantity	Weight
1	2001967	S Dome 1000 2.0	30	27.3 kg
2	2001968	Dome SD 2.0	30	6.9 kg
3	1001643	M K2 Slot nut with clip, Stainless steel	90	1.6 kg
4	2001729	Hexagonal socket head cap screw DIN 912/EN ISO 4762, M8x20, SER, A2-70	90	1.2 kg
5	2002324	Dome Wire Hanger	30	0.1 kg
6	2001739	K2 BSP Wing Solar Alu 160x180 18mm	30	10.5 kg
7	2001695	K2 BSP Wing Solar Alu 470x180 18mm	30	30.0 kg
8	1001163	K2 SpeedRail 22; 6,10 m	8	31.2 kg
9	1006039	K2 Connector SpeedRail/FlatRail Set	7	1.4 kg
10	1005843	K2 Dome Windbreaker 1700mm	25	27.5 kg
11	2001735	Hexagonal socket head cap screw DIN 912/EN ISO 4762, M8x16, SER, A2-70	60	0.7 kg
12	1000273	Washer 8,4x30x1,5 mm	60	0.4 kg
13	2000081	K2 Dome Porter	5	7.0 kg
14	2000155	K2 Dome Porter screw SET	3	0.2 kg
15	1004908	K2 Set XS Middle Clamp 39-44mm, 13mm, M8	40	2.8 kg
16	1005170	K2 Set End Clamp 39-41mm	20	1.5 kg
Total				150.3 kg