



| Connecting Strength

K2 Base Report

New project

Project address	Warrington Rd, Rainhill, Prescot L35 5DR, UK
Company	Solar Renewable Hub
Author	james wynne
Last updated by	james wynne
Issue date & version	22/05/2025 K2 Base Version 3.2.40.0

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About us

K2 Systems. Innovative mounting system from a strong team.

Since 2004 we have been developing pioneering and highly functional mounting system solutions for photovoltaic installations around the world. Our systems are designed in our own product development department where we continually optimize and adapt mounting systems to the ever-changing market.

A knowledgeable and friendly team

Just like a mountain climbing team, K2 Systems is built on mutual trust. This applies to our customer service as well as within the company itself, because we believe a trusting partnership leads to successful photovoltaic projects.

Our employees place total focus on the needs and wishes of our customer. This is true in all company departments.

10 locations and worldwide sales network

In our international team, everyone works together to provide customers with competent, comprehensive and entirely personalized service.

This is especially true in the constant training our employees undergo with regards to product optimization, quality assurance, or innovations in construction techniques.

Quality management and certificates

K2 Systems stands for Connecting Strength, the highest quality, and precision-crafted and customized components. Our customers and business partners deeply appreciate all of these factors. Three independent authorities have tested, confirmed, and certified our skills and components. External authorities are not the only ones to have put K2 Systems to the test. Our internal quality control ensures that all our products are subject to a constant review process.

These measures all ensure the outstanding quality standards that exemplify products from K2 Systems, and which we maintain through largely exclusive "Made in Germany" or "Made in Europe" practices.



Product guarantee

K2 Systems offers a 12-year product warranty on all products in its integrated range. The use of high quality materials and a three-level quality inspection ensure these standards.

In a nutshell

As roof-top specialists, we offer effective and economical solutions for roofs all around the world and provide professional, fast and reliable support for our customers in the solar industry.

The static report is not including module and building verification.

Project overview

Roofs

Roof	System	Module	Height	Quantity	Total power
Roof 1  Flat	S-Dome 6.10 Xpress	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	22.00 m	112	48.16 kWp
Roof 2  Flat	S-Dome 6.10 Xpress	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	22.00 m	101	43.43 kWp
Roof 3  Flat	S-Dome 6.10 Xpress	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	22.00 m	101	43.43 kWp
Roof 5  Trapezoidal	K2 BasicRail	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	20.00 m	80	34.4 kWp
Roof 6  Trapezoidal	K2 BasicRail	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	20.00 m	88	37.84 kWp
Total				482	207.26 kWp

Project information

Address	Warrington Rd, Rainhill, Prescot L35 5DR, UK
Author	james wyne

Load settings

Design method	BS EN
Failure consequence class (CC)	CC3
Design working life	25 years
Terrain category	Town Terrain
Basic wind speed	23.0 m/s
Distance to shoreline	18.00 km
Distance inside town terrain	1.00 km
Snow load zone	3
Snow load on ground level	0.50 kN/m ²

Material values



Project overview

For material information refer to the product catalogue:

[K2 Catalogue \(k2-systems.com\)](https://k2-systems.com)

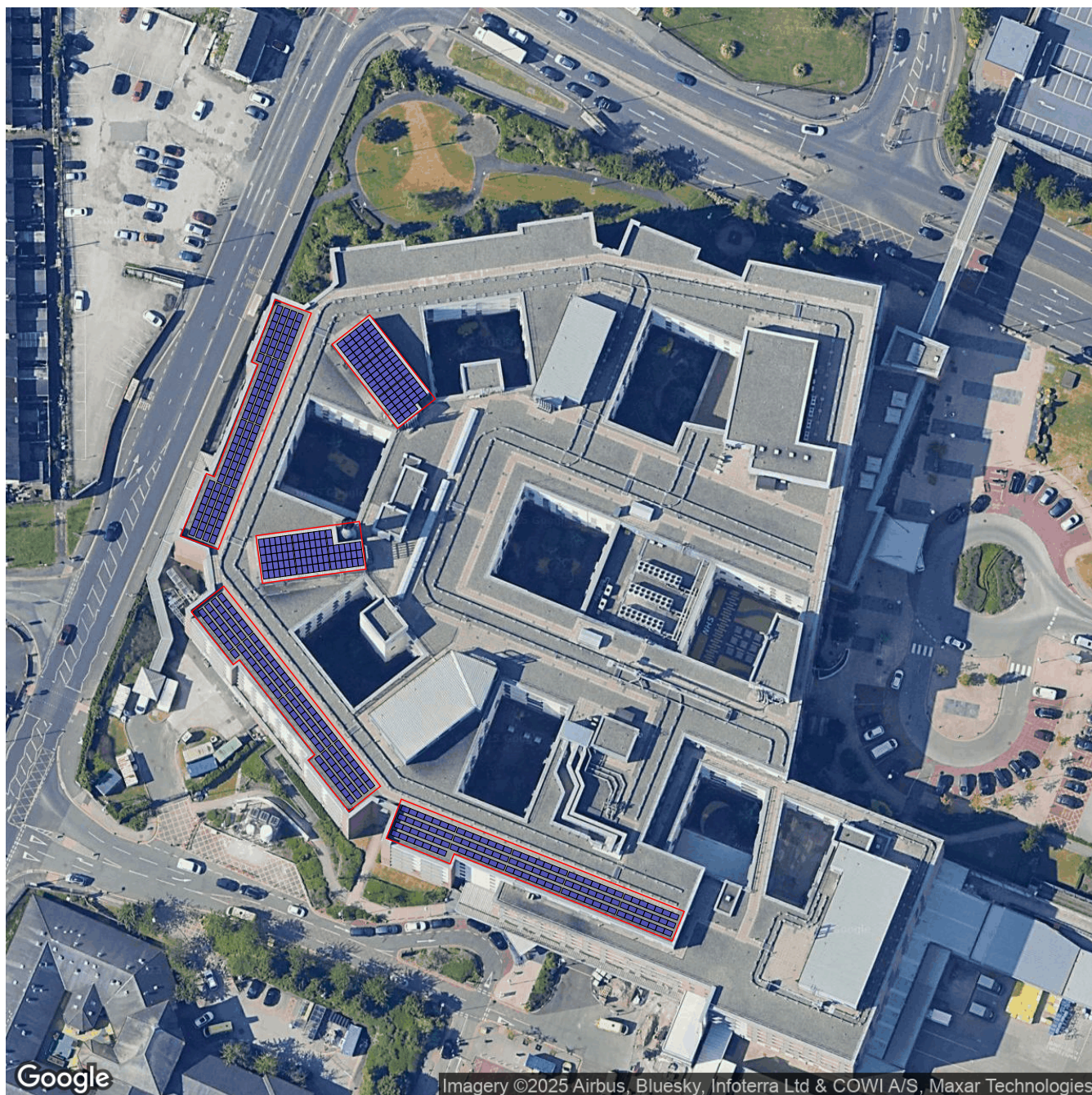


THE PROJECT IS VERIFIED.

The selected mounting system can be installed as planned

Thank you for choosing a K2 mounting system.

New project



Project information

Address

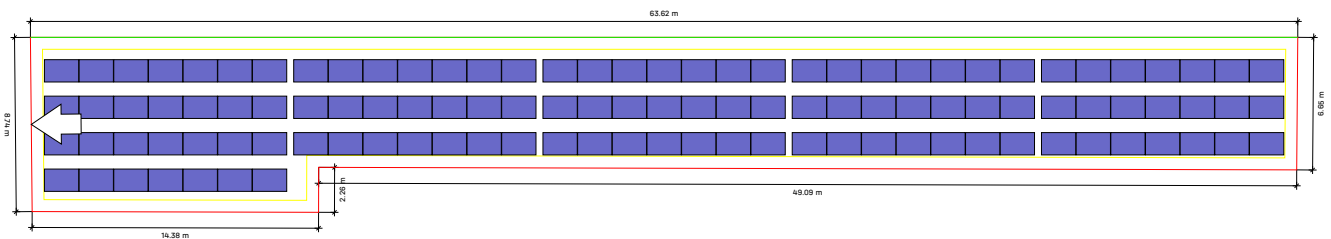
Warrington Rd, Rainhill, Prescot L35 5DR, UK

Author

james wynne

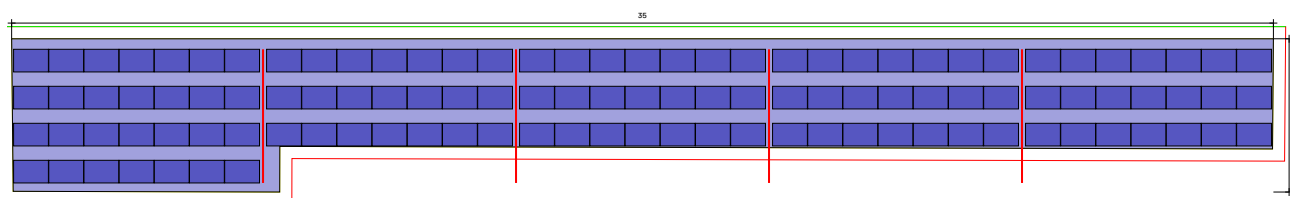


Roof 1



Roof	System	Module	Height	Quantity	Total power
<u>Roof 1</u>  Flat	<u>S-Dome 6.10</u> <u>Xpress</u>	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	22.00 m	112	48.16 kWp

Roof 1 | Module array 1



Roof ① Module array ①

Mounting System

[S-Dome 6.10 Xpress](#)

Module

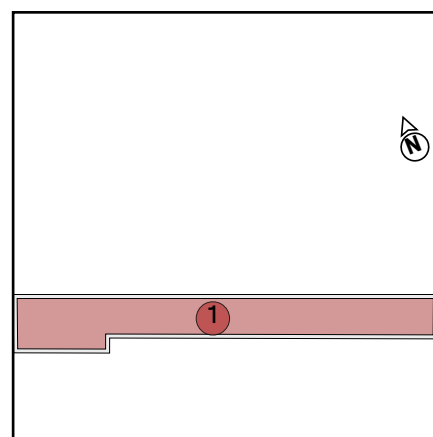
112(48.16 kWp) x DAS-DH108NA-430 (SchwarzThru)

Row spacing

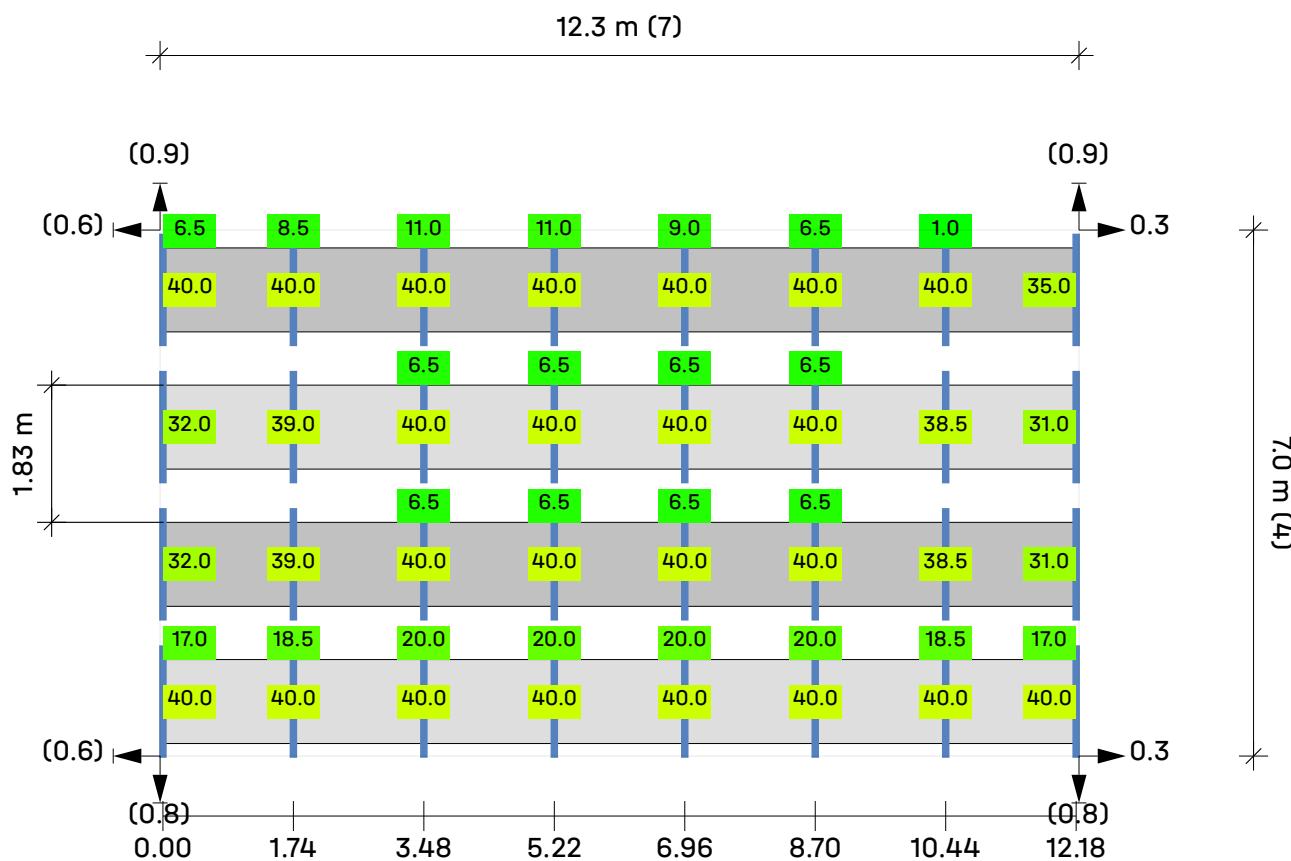
1.83 m

service corridor

0.71 m



Roof 1 | Module array 1 | Module blocks

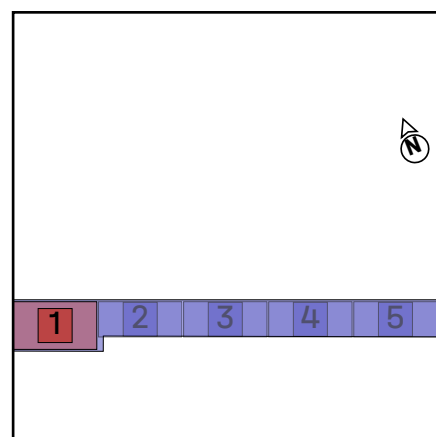


Roof ① Module array ① Module block ①

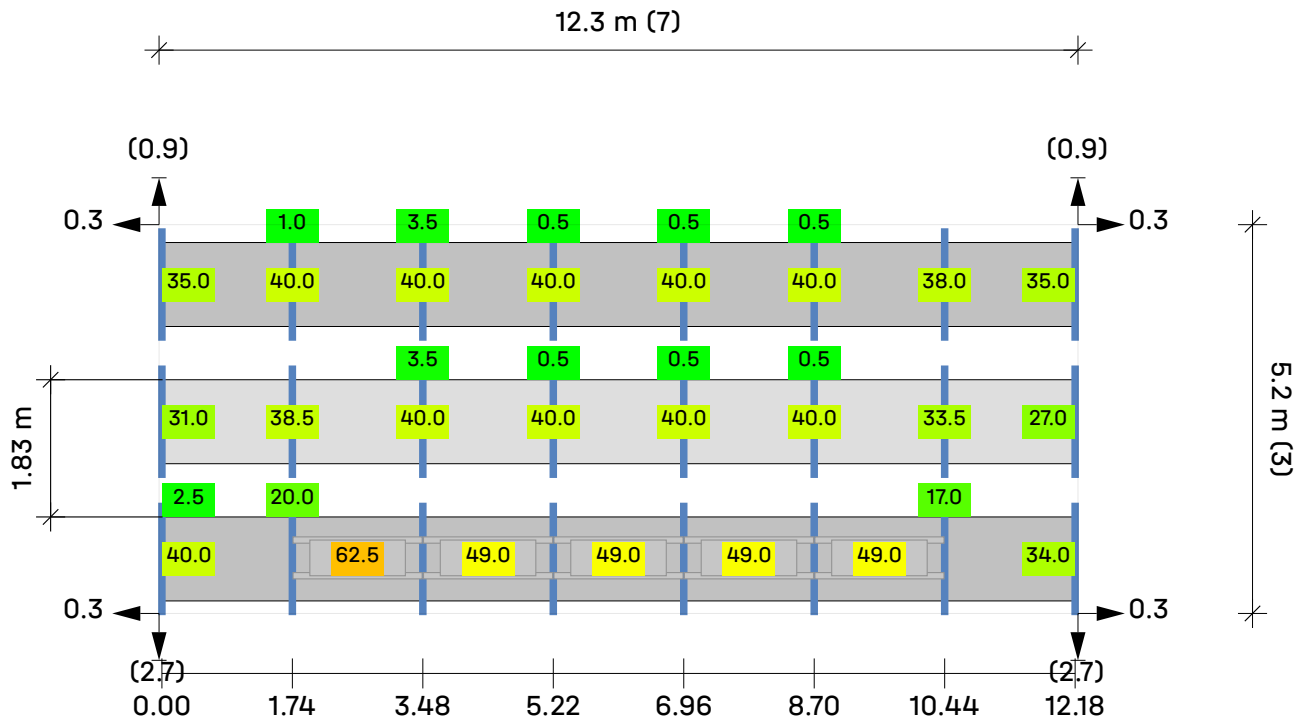
Modules $7 \times 4 = 28$

Legend

- Mounting rail
- Row distance [m]
- Distance to Roof Edge [m]
- Dist. to neighbour module block/array [m]
- 25 Ballast in kilogram (kg)
- Porter Ballast



Roof 1 | Module array 1 | Module blocks

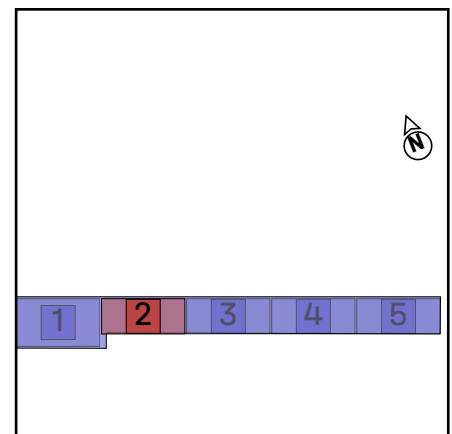


Roof ① Module array ① Module block ②

Modules $7 \times 3 = 21$

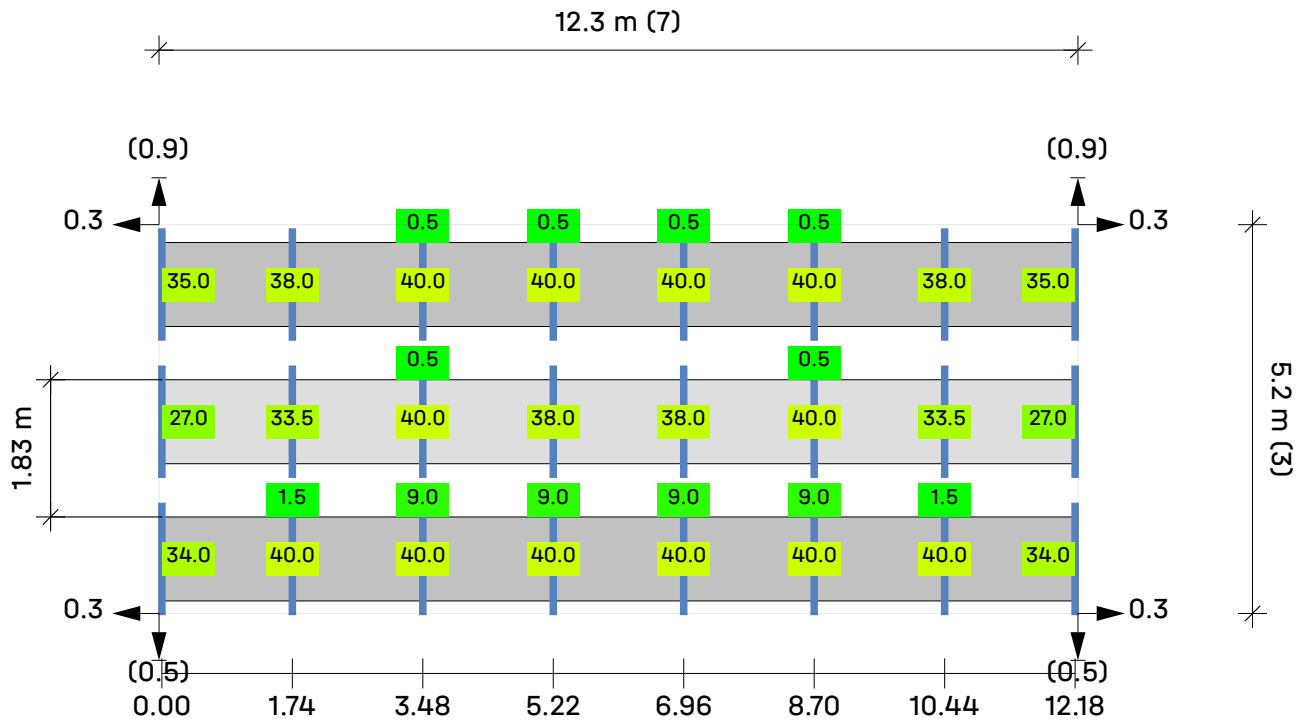
Legend

- Mounting rail
- Row distance [m]
- Distance to Roof Edge [m]
- Dist. to neighbour module block/array [m]
- 25 Ballast in kilogram (kg)
- Porter Ballast





Roof 1 | Module array 1 | Module blocks

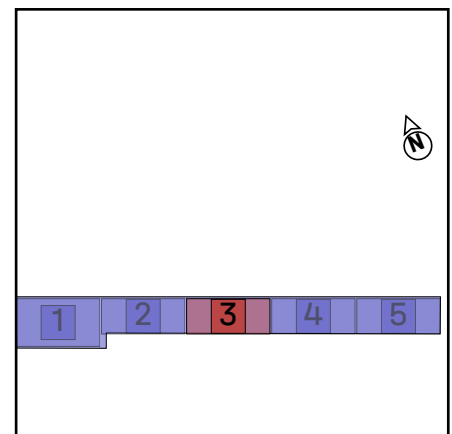


Roof ① Module array ① Module block ③

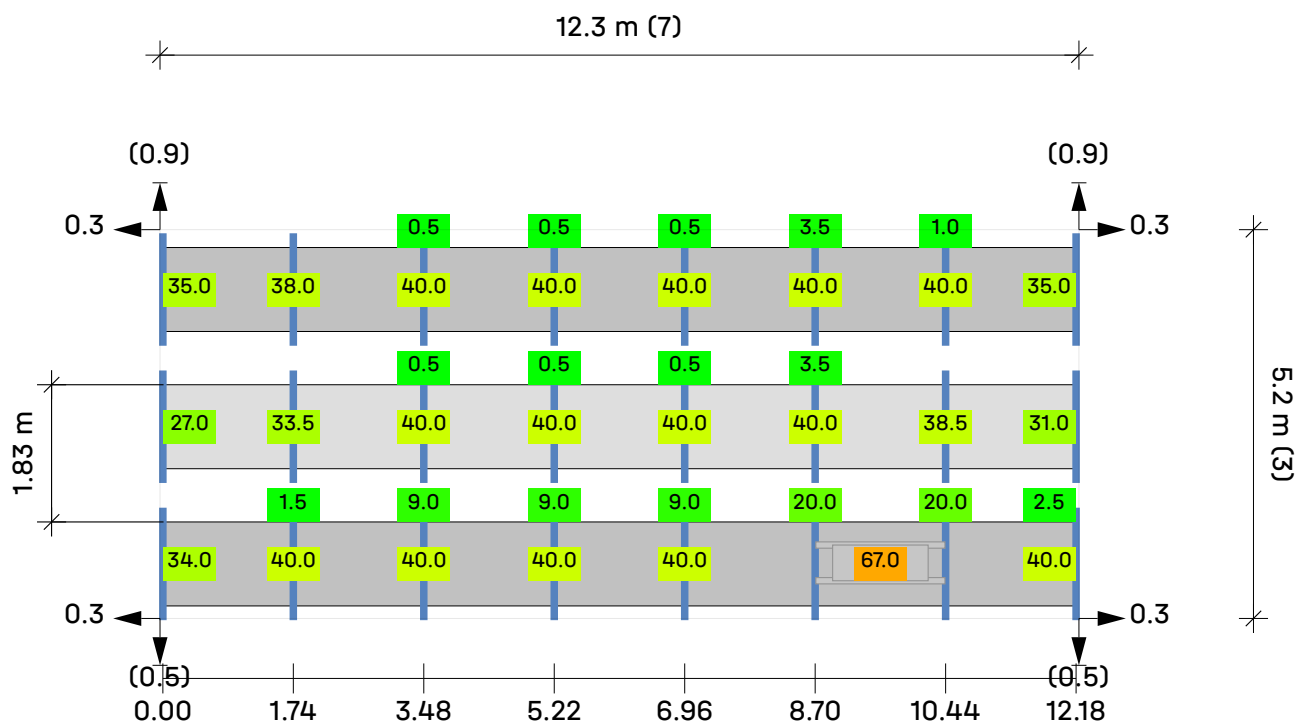
Modules $7 \times 3 = 21$

Legend

- Mounting rail
- Row distance [m]
- Distance to Roof Edge [m]
- Dist. to neighbour module block/array [m]
- 25 Ballast in kilogram (kg)
- Porter Ballast



Roof 1 | Module array 1 | Module blocks

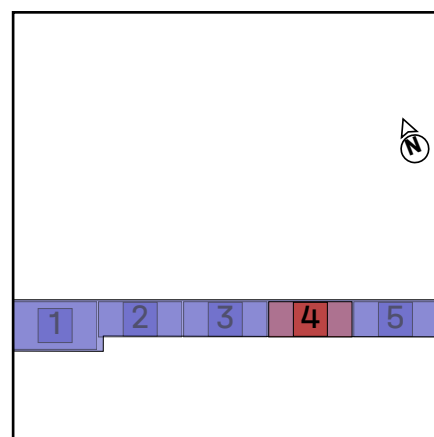


Roof ① Module array ① Module block 4

Modules $7 \times 3 = 21$

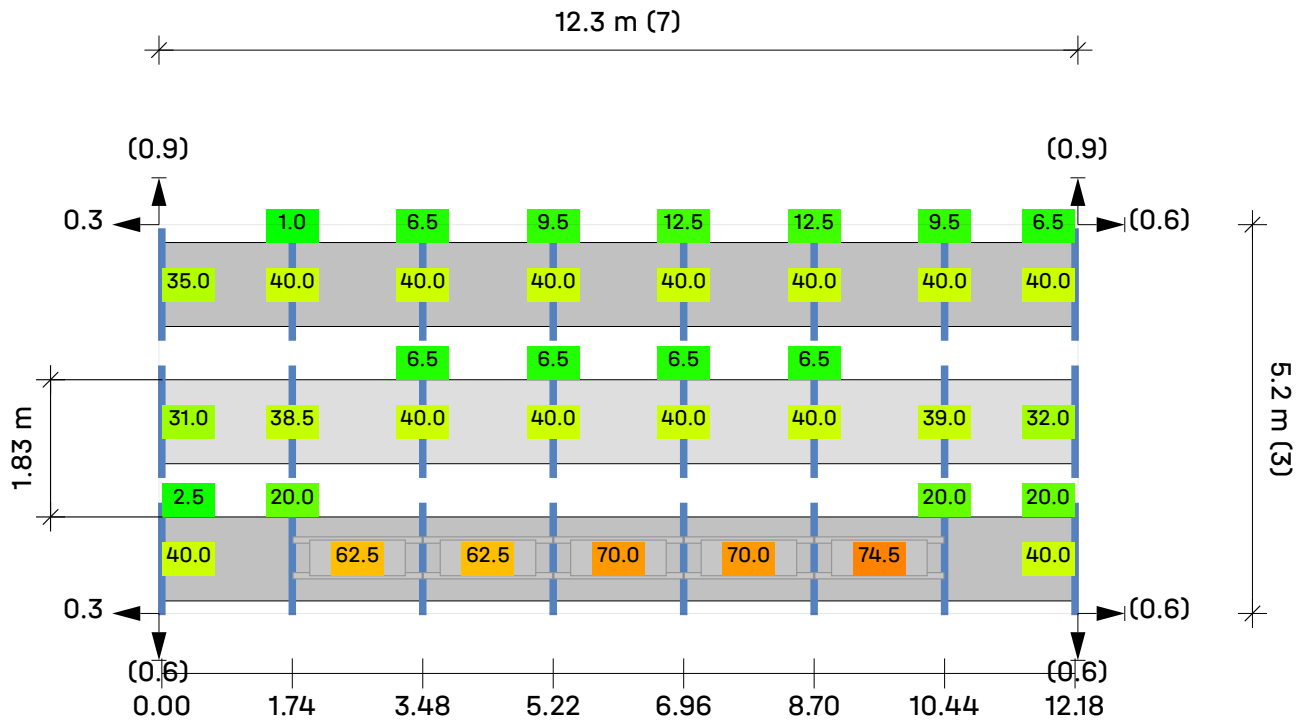
Legend

- Mounting rail
- Row distance [m]
- Distance to Roof Edge [m]
- Dist. to neighbour module block/array [m]
- 25 Ballast in kilogram (kg)
- Porter Ballast





Roof 1 | Module array 1 | Module blocks

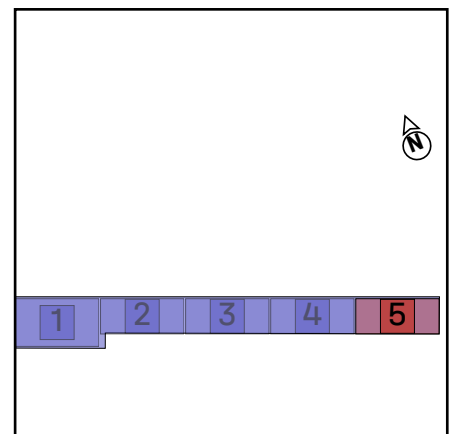


Roof ① Module array ① Module block ⑤

Modules $7 \times 3 = 21$

Legend

- Mounting rail
- Row distance [m]
- Distance to Roof Edge [m]
- Dist. to neighbour module block/array [m]
- 25 Ballast in kilogram (kg)
- Porter Ballast



Results | Roof 1

Roof	System	Module	Height	Quantity	Total power
Roof 1  Flat	S-Dome 6.10 Xpress	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	22.00 m	112	48.16 kWp

Module

Name	DAS-DH108NA-430 (SchwarzThru)
Manufacturer	DAS Solar (Quzhou) Co., Ltd.
Output power	430 Wp
Dimensions	1,722×1,134×30 mm
Weight	20.5 kg

Module clamps

module clamp	DomeClamp Black MC Set 30-50
end clamp	DomeClamp Black EC Set 30-50

Ballast capacity

Speed Porter	40.0 kg
Porter	108.0 kg

Verification system utilisation

Type	pressure	suction
Verification system utilisation	66.05%	70.34%
Loads on modules (ultimate state)	2.51 kN/m ²	-1.95 kN/m ²
Loads on modules (Serviceability)	1.53 kN/m ²	-1.15 kN/m ²

Specific loads

Module block	No. of modules	Ballast [kg]	Dead weight [kg]	Module block area [m ²] (incl. service corridor)	Dead Load [kN/m ²]	Dead load (roof surface area) [kN/m ²]
Block 1	28	1,492.5	2,234.50	85.98 m ²	0.25	
Block 2	21	981.0	1,537.50	63.55 m ²	0.24	
Block 3	21	933.0	1,489.50	63.55 m ²	0.23	
Block 4	21	981.0	1,537.50	63.55 m ²	0.24	
Block 5	21	1,181.5	1,738.00	63.55 m ²	0.27	
Total	112	5,569.0	8,537.00			0.19



Results | Roof 1

Important Information

- The static equilibrium and load-bearing capacity of the system is verified by checking the load cases of uplift and downforce due to wind in accordance with the expert opinion of Ruscheweyh Consult GmbH.
- You will find a short version of the wind tunnel report and a certificate for the further static calculations on our homepage.
- The structure was statically verified in accordance with Eurocode 9: Design of aluminium structures (DIN EN 1999-1-1:2021) and offers sufficient load-bearing capacity and stability for the loads specified in the chapter 'Maximum actions on the components'.
- Adjustment factor for wind load regarding service life period, f_W , is according to DIN EN 1991-1-4/ NA, NDP for 4.2 (2P) note 5, table 3
- Adjustment factor for snow load regarding service life period, f_S , is according to DIN EN 1991-1-3/ annex D, table 4
- All resistance values of components are determined from an extern static engineering office.
- The structural design complies with BS EN 1990 - Basis of Structural Design.
- Snow loads are determined in accordance with National Annex BS NA EN 1991-1-3 (2018) - UK National Annex to EC1 - Action on structures - general actions - snow loads.
- Wind loads are determined in accordance with National Annex BS NA EN 1991-1-4 - UK National Annex to EC1 - Action on structures, general actions - wind actions.
- 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'.
- The person responsible for the execution of the work must check the load assumptions made with the conditions on site. If deviations are found, the person who prepared the static calculation must be consulted immediately. , in particular § 2 ("technical and specialist requirements for the customer"), § 7 ("warranty provisions") and § 8 ("limitation of liability").



Structural analysis report | Roof 1

General information

Name	New project
Mounting System	S-Dome 6.10 Xpress
Author	james wynne

Location information

Address	Warrington Rd, Rainhill, Prescot L35 5DR, UK
Ground elevation	64.79 m

Roof information

Building height	22.00 m
Roof type	Flat roof
Roof pitch	2°
Fastening method	with Ballast
Roof covering	Flat
Min. roof edge distance	0.60 m
Parapet wall height	0.50 m
Material	Concrete
Friction coefficient	1

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	BS EN
Failure consequence class (CC)	CC3
Design working life	25 years
Terrain category	Town Terrain
Distance to shoreline	18.00 km
Distance inside town terrain	1.00 km

Wind load

Velocity pressure, 50 years	$q_{p,50} = 1.078 \text{ kN/m}^2$
Adjustment factor for service life	$f_w = 1.000$
Velocity pressure, 25 years	$q_{p,25} = 0.993 \text{ kN/m}^2$



Structural analysis report | Roof 1

Snow load

Snow load zone	3
Snow guard	No
Snow load on ground level	$s_k = 0.500 \text{ kN/m}^2$
Shape Coefficient for Snow	$\mu_i = 0.800$
Factor for roof pitch	$d_i = 0.999$
Snow load on roof, 50 year	$s_{i,50} = 0.400 \text{ kN/m}^2$
Adjustment factor for service life	$f_s = 1.000$
Snow load on roof, 25 years	$s_{i,25} = 0.371 \text{ kN/m}^2$

Dead Load

Weight of module	$G_M = 20.5 \text{ kg}$
Weight of mounting system per module	$= 6.0 \text{ kg}$
Module area	$A_M = 1.95 \text{ m}^2$
Dead weight of module per m^2	$= 10.50 \text{ kg/m}^2$
Dead weight of mounting system per m^2	$= 3.07 \text{ kg/m}^2$
Total Dead Load (excl. ballast) per m^2	$= 0.13 \text{ kN/m}^2$

Load Combinations

Ultimate limit state

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 variable loads	$\gamma_Q = 1.50$
Combination coefficient with regards to wind	$\psi_{0,W} = 0.60$
Combination coefficient with regards to Snow	$\psi_{0,S} = 0.50$
Importance factor permanent	$\kappa_{Fl,G} = 1.10$
Importance factor variable	$\kappa_{Fl,Q} = 1.10$
Characteristic dead weight	G_k
Characteristic snow load on the roof	$S_{i,n}$
Characteristic wind load	W_k

Load case combination 01	$LCC\ 01_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * S_{i,n}$
Load case combination 02	$LCC\ 02_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,Pressure}$
Load case combination 03	$LCC\ 03_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * (W_{k,Pressure} + \psi_{0,S} * S_{i,n})$
Load case combination 04	$LCC\ 04_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * (S_{i,n} + \psi_{0,W} * W_{k,Pressure})$
Load case combination 06	$LCC\ 06_{uls} = \gamma_{G,inf} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,Suction}$

Structural analysis report | Roof 1

Static equilibrium

Uplift Verification	$LCC_{up} = \gamma_{G, stb} * G_k + \gamma_Q * \kappa_{Fl, Q} * W_{k, n, Uplift}$
Displacement verification	$LCC_{displ} = \gamma_{G, stb} * G_k + \gamma_Q * \kappa_{Fl, Q} * W_{k, n, Displacement}$

Serviceability limit state

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 01	$LCC_{01_sls} = G_k + S_{i, n}$
Load case combination 02	$LCC_{02_sls} = G_k + W_{k, Pressure}$
Load case combination 03	$LCC_{03_sls} = G_k + W_{k, Pressure} + \psi_{0, S} * S_{i, n}$
Load case combination 04	$LCC_{04_sls} = G_k + S_{i, n} + \psi_{0, w} * W_{k, Pressure}$
Load case combination 06	$LCC_{06_sls} = G_k + W_{k, Suction}$

Max. Pressure on insulation

General information

dead load system	$g_{System} = 0.13 \text{ kN/m}^2$
aerodynamic coefficient	$C_{p, Pressure} = 0.20$

Load distribution underneath the building protection mat under Peak (45°)

Dimensions	$75.3 \times 380.0 \times 23.1 \text{ mm}$
	$A_{eff} = 28,614.00 \text{ mm}^2$
	$A_{load \text{ range area}} = 0.98 \text{ m}^2$
maximum ballast	$G_{ballast \text{ required}} = 47.7 \text{ kg}$

Load distribution underneath the building protection mat under SD (45°)

Dimensions	$75.3 \times 380.0 \times 23.1 \text{ mm}$
	$A_{eff} = 28,614.00 \text{ mm}^2$
	$A_{load \text{ range area}} = 0.98 \text{ m}^2$
maximum ballast	$G_{ballast \text{ required}} = 24.6 \text{ kg}$

Load Combinations

	$\sigma_{Ek, heat \text{ insulation}, S6_{10}} [\text{Pa}]$	$\sigma_{Ek, heat \text{ insulation}, SD} [\text{Pa}]$
Load case combination 00	20,884	12,960
Load case combination 01	34,365	26,441

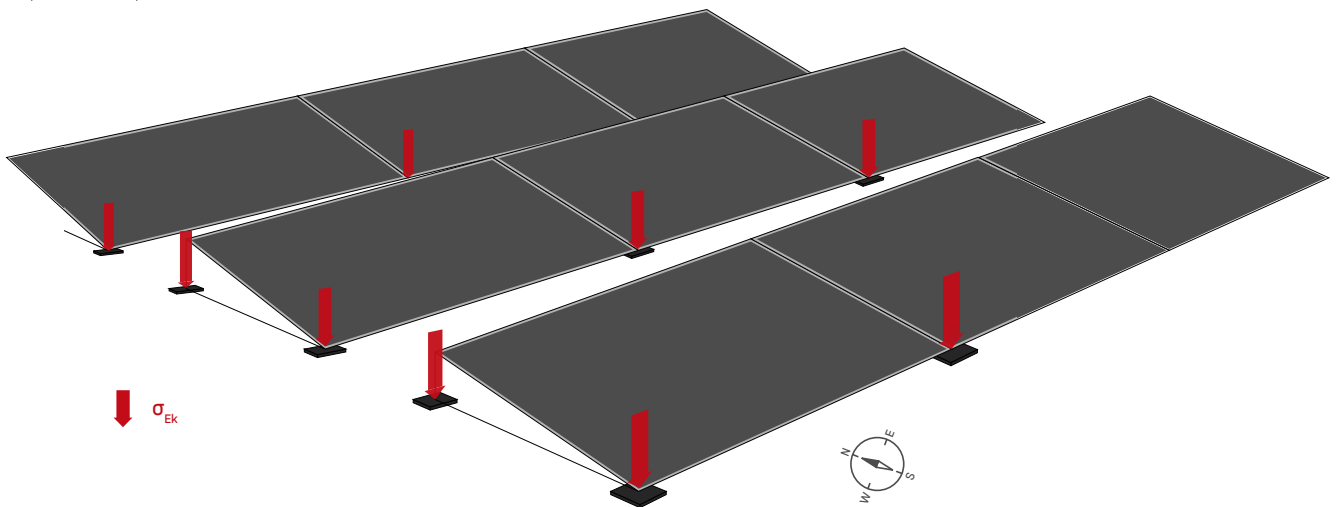


Structural analysis report | Roof 1

Dead loads (PV system + ballast)

 $\sigma_{\text{Ek,heat insulation,S6}_10}$ $\sigma_{\text{Ek}} = 20,884 \text{ Pa}$ $\sigma_{\text{Ek,heat insulation,SD}}$ $\sigma_{\text{Ek}} = 12,960 \text{ Pa}$

Maximum actions (sum of dead loads and snow)

 $\sigma_{\text{Ek,heat insulation,S6}_10}$ $\max \sigma_{\text{Ek}} = 34,365 \text{ Pa}$ $\sigma_{\text{Ek,heat insulation,SD}}$ $\max \sigma_{\text{Ek}} = 26,441 \text{ Pa}$ 

H-V-loads

According to wind tunnel report by I.F.I. Institut für Industrieaerodynamik GmbH

General information

Total number of modules

112

Roof areas covered with modules

A = ca. 340.17 m²

Dead Load

$g_{k,\text{System incl. ballast}} = 0.25 \text{ kN/m}^2$

Aerodynamic coefficients

$C_{p,\text{Pressure}}$ = according to EN 1991-1-4

$C_{F,x,\text{average}}$
d = 0.01

$C_{F,y,\text{averaged}}$ = -0.02

edge distance correction

$k_{s,xy} = 1.00$

Parapet wall- correction coefficient

$k_p = 1.00$

Factor building height

= 1.00

Structural analysis report | Roof 1

Horizontal pressure

$$W_{k,F,x} = 0.009 \text{ kN/m}^2$$

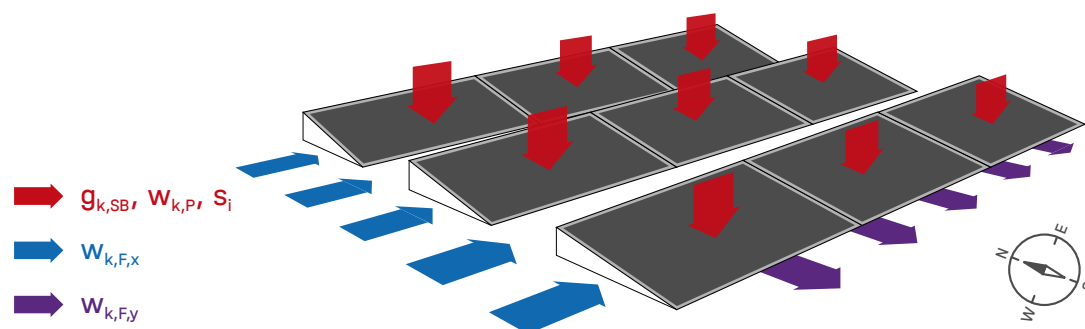
$$W_{k,F,y} = -0.019 \text{ kN/m}^2$$

Vertical pressure

$$g_{k,\text{System incl. ballast}} = 0.25 \text{ kN/m}^2$$

$$W_{k,\text{Pressure}} \quad - \text{ according to EN 1991-1-4}$$

$$s_i \quad - \text{ according to EN 1991-1-3}$$



Comment:

Flat roof vertical wind loads are essentially determined by its displacement effect and remain unchanged even with a flat pv structure. We advise using the aerodynamic coefficients according to DIN EN 1991-1-4 to calculate flat roofs.

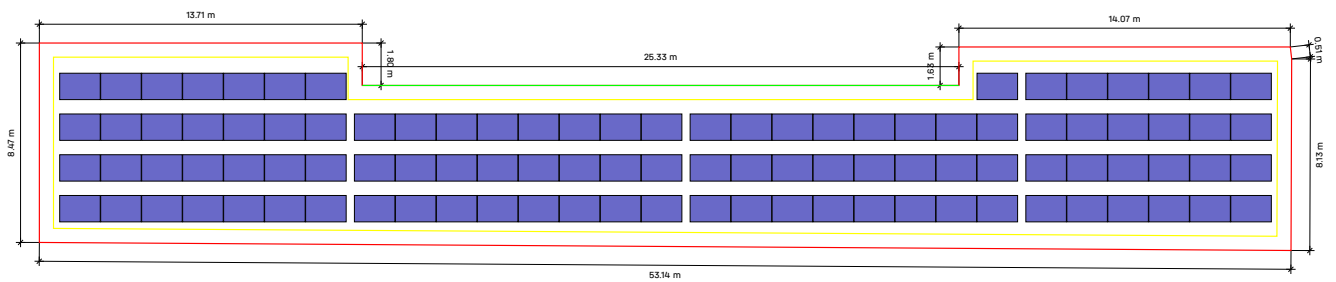


Roof 1 | Bill of material

Position	Item no.	Item description	Quantity	Weight
1	2004096	S-Dome 6.10 Base Set L	128	240.6 kg
2	2004125	Dome 6.10 Peak	128	38.4 kg
3	2004178	Dome 6 Connector 495mm Set	88	36.3 kg
4	2003249	S-Dome 6.10 Windbreaker short	112	201.6 kg
5	2002937	Thread-forming metal screw 6×25	256	1.8 kg
6	2002870	K2 Solar Cable Manager	112	0.3 kg
7	2002609	DomeClamp Black MC Set 30-50	192	11.1 kg
8	2002610	DomeClamp Black EC Set 30-50	64	4.2 kg
9	2003150	Dome Porter short	22	32.5 kg
10	1001643	MK2	44	0.8 kg
11	2001729	Socket Head Bolt serrated M8×20	44	0.6 kg
12	2002300	Dome SpeedPorter	384	29.2 kg
Total				597.5 kg

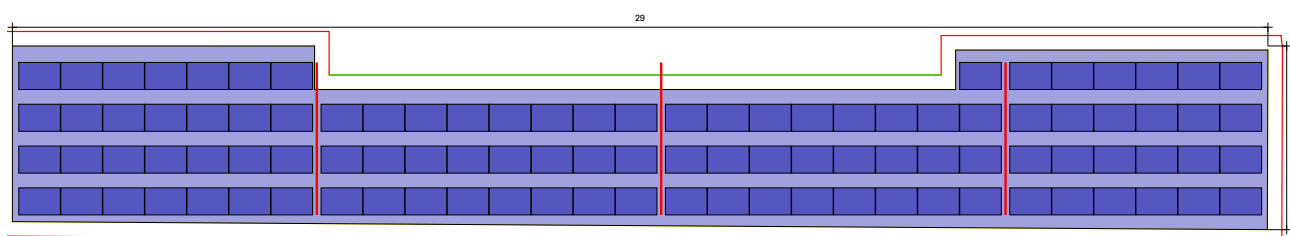


Roof 2



Roof	System	Module	Height	Quantity	Total power
<u>Roof 2</u>  Flat	<u>S-Dome 6.10</u> <u>Xpress</u>	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	22.00 m	101	43.43 kWp

Roof 2 | Module array 1



Roof ② Module array ①

Mounting System

[S-Dome 6.10 Xpress](#)

Module

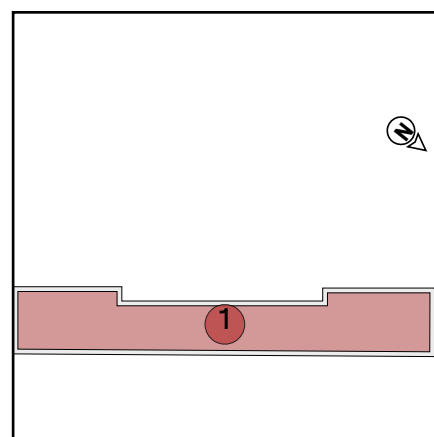
101(43.43 kWp) x DAS-DH108NA-430 (SchwarzThru)

Row spacing

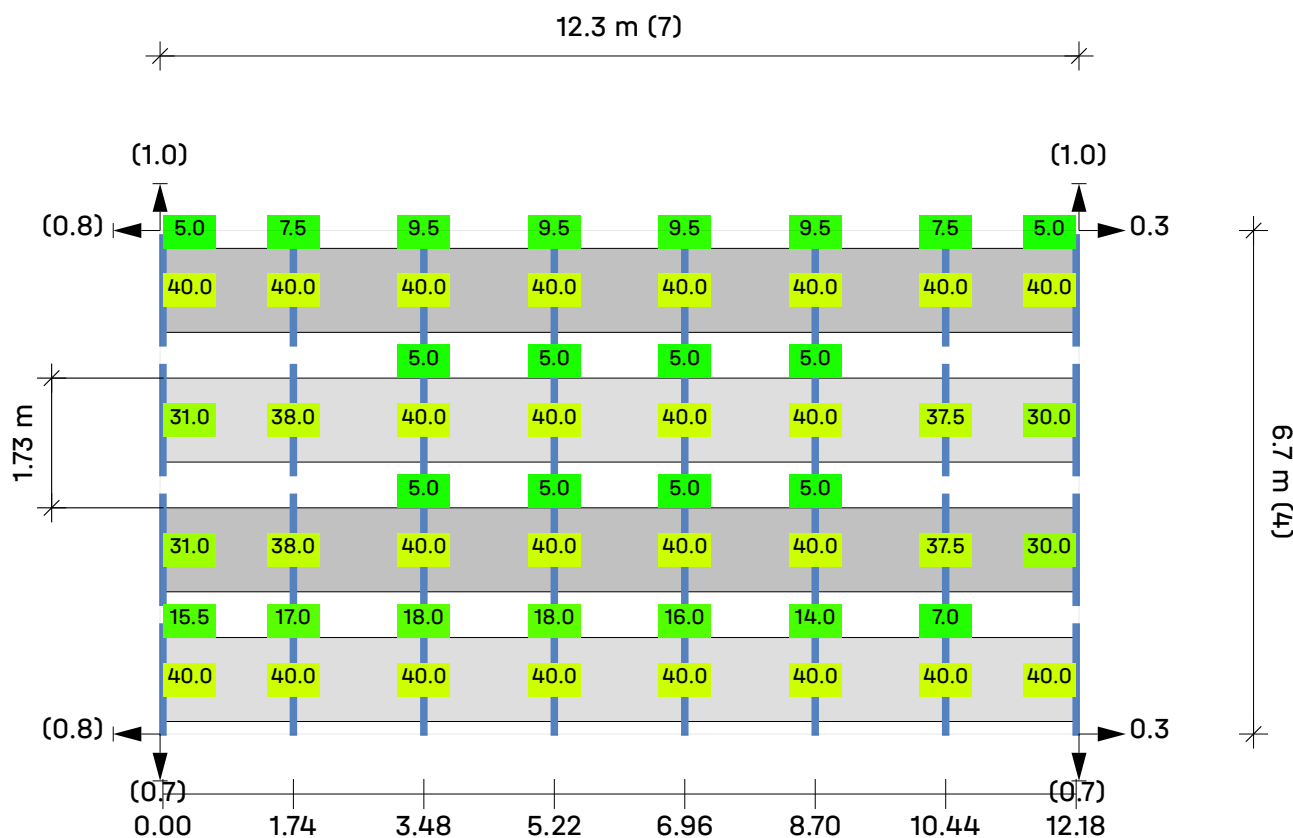
1.73 m

service corridor

0.61 m



Roof 2 | Module array 1 | Module blocks

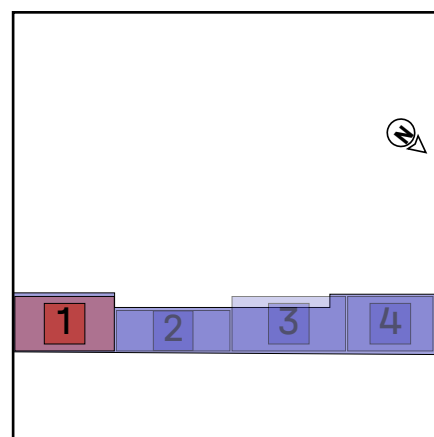


Roof ② Module array ① Module block ①

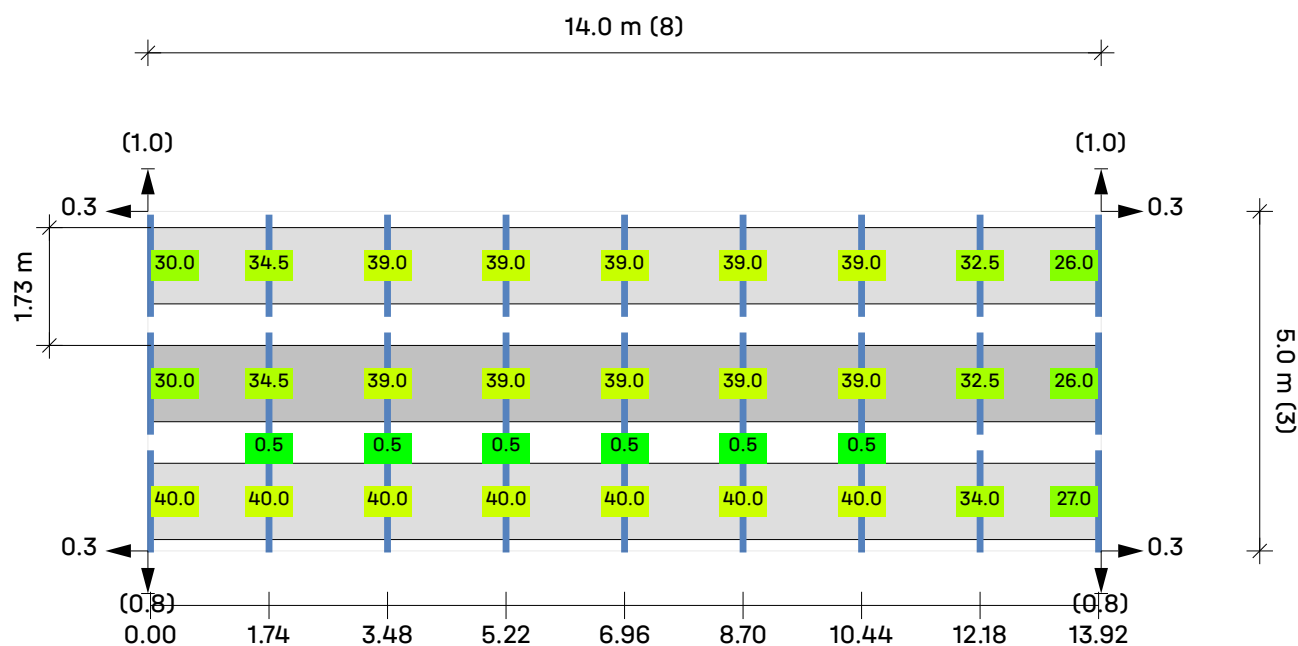
Modules $7 \times 4 = 28$

Legend

- Mounting rail
- Row distance [m]
- Distance to Roof Edge [m]
- Dist. to neighbour module block/array [m]
- 25 Ballast in kilogram (kg)
- Porter Ballast



Roof 2 | Module array 1 | Module blocks

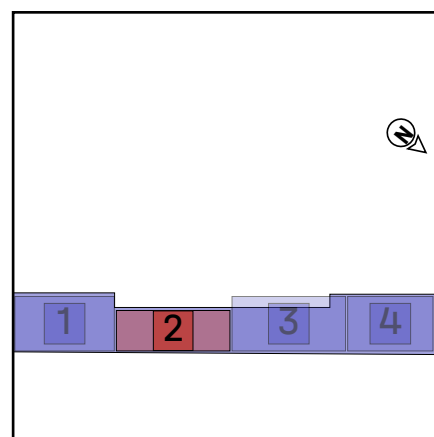


Roof ② Module array ① Module block ②

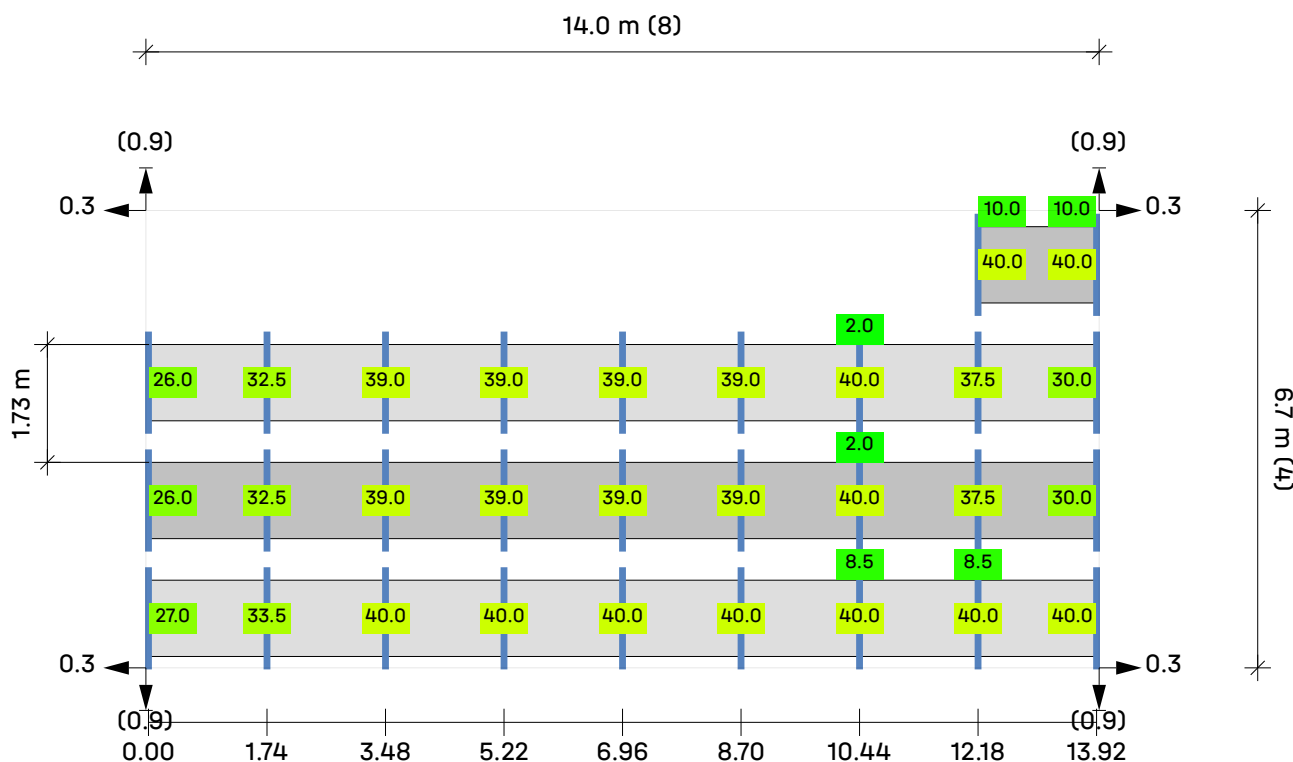
Modules $8 \times 3 = 24$

Legend

- Mounting rail
- Row distance [m]
- Distance to Roof Edge [m]
- Dist. to neighbour module block/array [m]
- 25 Ballast in kilogram (kg)
- Porter Ballast



Roof 2 | Module array 1 | Module blocks

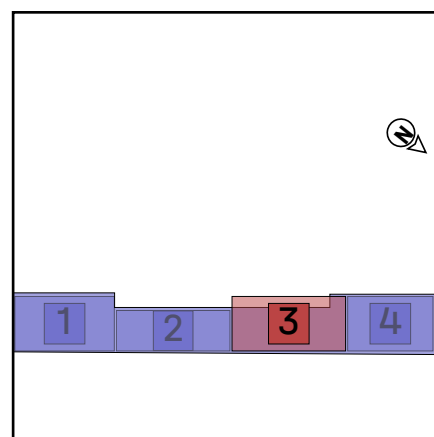


Roof ② Module array ① Module block ③

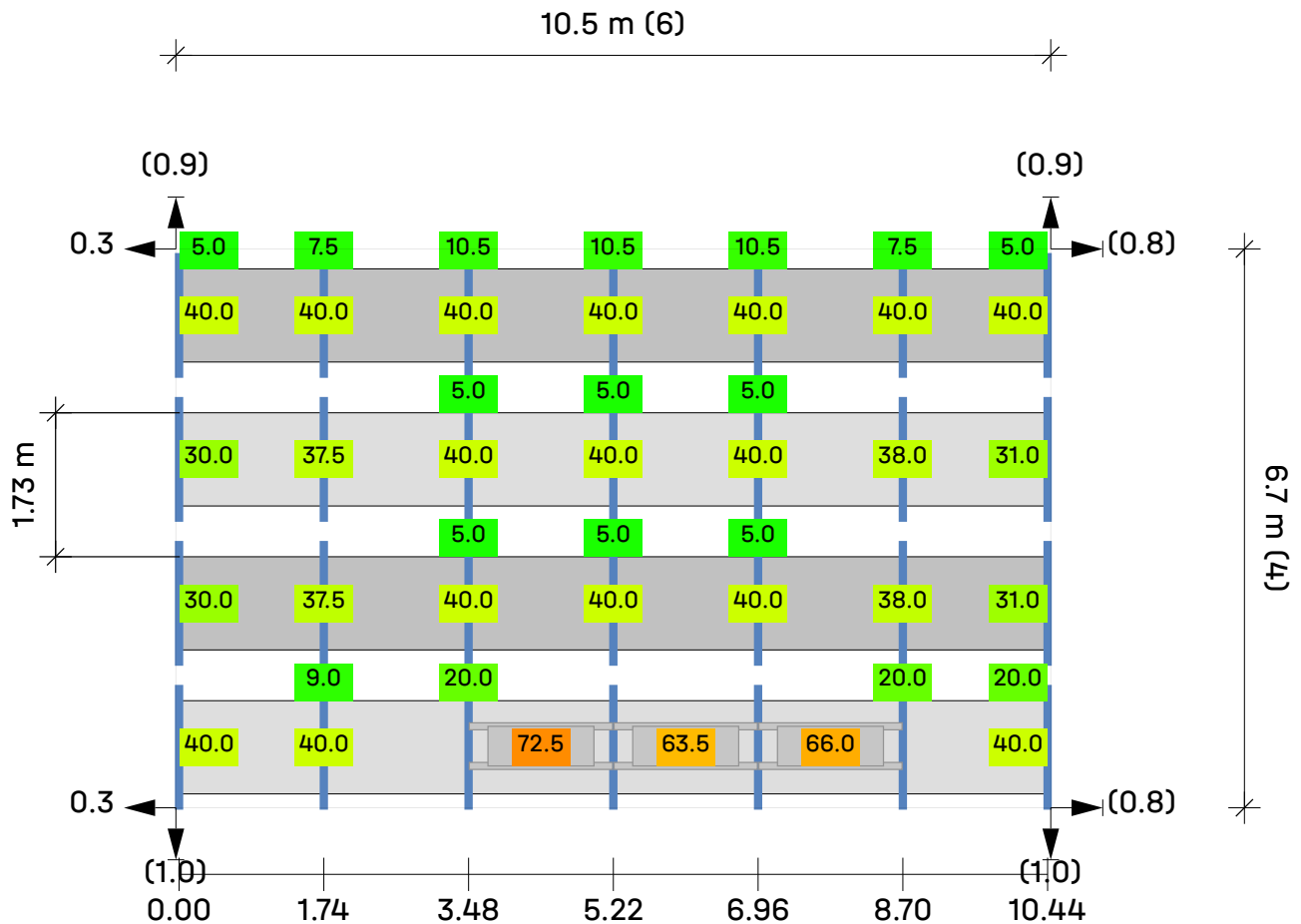
Modules $(8 \times 4) - 7 = 25$

Legend

- Mounting rail
- Row distance [m]
- Distance to Roof Edge [m]
- Dist. to neighbour module block/array [m]
- Ballast in kilogram (kg)
- Porter Ballast



Roof 2 | Module array 1 | Module blocks

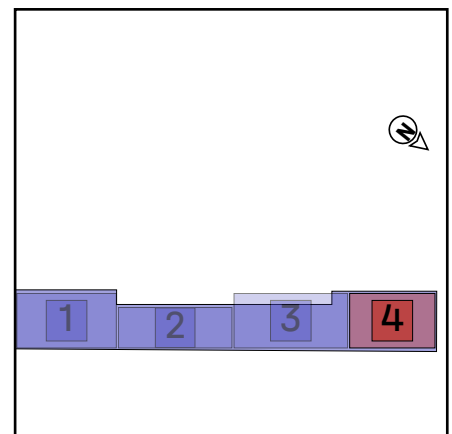


Roof ② Module array ① Module block ④

Modules $6 \times 4 = 24$

Legend

- Mounting rail
- Row distance [m]
- Distance to Roof Edge [m]
- Dist. to neighbour module block/array [m]
- 25 Ballast in kilogram (kg)
- Porter Ballast



Results | Roof 2

Roof	System	Module	Height	Quantity	Total power
Roof 2  Flat	S-Dome 6.10 Xpress	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	22.00 m	101	43.43 kWp

Module

Name	DAS-DH108NA-430 (SchwarzThru)
Manufacturer	DAS Solar (Quzhou) Co., Ltd.
Output power	430 Wp
Dimensions	1,722×1,134×30 mm
Weight	20.5 kg

Module clamps

module clamp	DomeClamp Black MC Set 30-50
end clamp	DomeClamp Black EC Set 30-50

Ballast capacity

Speed Porter	40.0 kg
Porter	108.0 kg

Verification system utilisation

Type	pressure	suction
Verification system utilisation	64.93%	68.80%
Loads on modules (ultimate state)	2.47 kN/m ²	-1.91 kN/m ²
Loads on modules (Serviceability)	1.51 kN/m ²	-1.12 kN/m ²

Specific loads

Module block	No. of modules	Ballast [kg]	Dead weight [kg]	Module block area [m ²] (incl. service corridor)	Dead Load [kN/m ²]	Dead load (roof surface area) [kN/m ²]
Block 1	28	1,441.5	2,183.50	82.30 m ²	0.26	
Block 2	24	980.0	1,616.00	69.77 m ²	0.23	
Block 3	25	1,105.5	1,768.00	72.91 m ²	0.24	
Block 4	24	1,270.5	1,906.50	70.61 m ²	0.26	
Total	101	4,797.5	7,474.00			0.18

Results | Roof 2

Important Information

- The static equilibrium and load-bearing capacity of the system is verified by checking the load cases of uplift and downforce due to wind in accordance with the expert opinion of Ruscheweyh Consult GmbH.
- You will find a short version of the wind tunnel report and a certificate for the further static calculations on our homepage.
- The structure was statically verified in accordance with Eurocode 9: Design of aluminium structures (DIN EN 1999-1-1:2021) and offers sufficient load-bearing capacity and stability for the loads specified in the chapter 'Maximum actions on the components'.
- Adjustment factor for wind load regarding service life period, f_W , is according to DIN EN 1991-1-4/ NA, NDP for 4.2 (2P) note 5, table 3
- Adjustment factor for snow load regarding service life period, f_S , is according to DIN EN 1991-1-3/ annex D, table 4
- All resistance values of components are determined from an extern static engineering office.
- The structural design complies with BS EN 1990 - Basis of Structural Design.
- Snow loads are determined in accordance with National Annex BS NA EN 1991-1-3 (2018) - UK National Annex to EC1 - Action on structures - general actions - snow loads.
- Wind loads are determined in accordance with National Annex BS NA EN 1991-1-4 - UK National Annex to EC1 - Action on structures, general actions - wind actions.
- 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'.
- The person responsible for the execution of the work must check the load assumptions made with the conditions on site. If deviations are found, the person who prepared the static calculation must be consulted immediately. , in particular § 2 ("technical and specialist requirements for the customer"), § 7 ("warranty provisions") and § 8 ("limitation of liability").



Structural analysis report | Roof 2

General information

Name	New project
Mounting System	S-Dome 6.10 Xpress
Author	james wynne

Location information

Address	Warrington Rd, Rainhill, Prescot L35 5DR, UK
Ground elevation	64.79 m

Roof information

Building height	22.00 m
Roof type	Flat roof
Roof pitch	2°
Fastening method	with Ballast
Roof covering	Flat
Min. roof edge distance	0.60 m
Parapet wall height	0.50 m
Material	Concrete
Friction coefficient	1

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	BS EN
Failure consequence class (CC)	CC3
Design working life	25 years
Terrain category	Town Terrain
Distance to shoreline	18.00 km
Distance inside town terrain	1.00 km

Wind load

Velocity pressure, 50 years	$q_{p,50} = 1.078 \text{ kN/m}^2$
Adjustment factor for service life	$f_w = 1.000$
Velocity pressure, 25 years	$q_{p,25} = 0.993 \text{ kN/m}^2$



Structural analysis report | Roof 2

Snow load

Snow load zone	3
Snow guard	No
Snow load on ground level	$s_k = 0.500 \text{ kN/m}^2$
Shape Coefficient for Snow	$\mu_i = 0.800$
Factor for roof pitch	$d_i = 0.999$
Snow load on roof, 50 year	$s_{i,50} = 0.400 \text{ kN/m}^2$
Adjustment factor for service life	$f_s = 1.000$
Snow load on roof, 25 years	$s_{i,25} = 0.371 \text{ kN/m}^2$

Dead Load

Weight of module	$G_M = 20.5 \text{ kg}$
Weight of mounting system per module	$= 6.0 \text{ kg}$
Module area	$A_M = 1.95 \text{ m}^2$
Dead weight of module per m^2	$= 10.50 \text{ kg/m}^2$
Dead weight of mounting system per m^2	$= 3.07 \text{ kg/m}^2$
Total Dead Load (excl. ballast) per m^2	$= 0.13 \text{ kN/m}^2$

Load Combinations

Ultimate limit state

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 variable loads	$\gamma_Q = 1.50$
Combination coefficient with regards to wind	$\psi_{0,W} = 0.60$
Combination coefficient with regards to Snow	$\psi_{0,S} = 0.50$
Importance factor permanent	$\kappa_{Fl,G} = 1.10$
Importance factor variable	$\kappa_{Fl,Q} = 1.10$
Characteristic dead weight	G_k
Characteristic snow load on the roof	$S_{i,n}$
Characteristic wind load	W_k

Load case combination 01	$LCC\ 01_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * S_{i,n}$
Load case combination 02	$LCC\ 02_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,Pressure}$
Load case combination 03	$LCC\ 03_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * (W_{k,Pressure} + \psi_{0,S} * S_{i,n})$
Load case combination 04	$LCC\ 04_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * (S_{i,n} + \psi_{0,W} * W_{k,Pressure})$
Load case combination 06	$LCC\ 06_{uls} = \gamma_{G,inf} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,Suction}$



Structural analysis report | Roof 2

Static equilibrium

Uplift Verification

$$\text{LCC up} = \gamma_{G, \text{stb}} * G_k + \gamma_Q * \kappa_{F1, Q} * W_{k, n, \text{Uplift}}$$

Displacement verification

$$\text{LCC displ} = \gamma_{G, \text{stb}} * G_k + \gamma_Q * \kappa_{F1, Q} * W_{k, n, \text{Displacement}}$$

Serviceability limit state

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 01

$$\text{LCC 01_sls} = G_k + S_{i, n}$$

Load case combination 02

$$\text{LCC 02_sls} = G_k + W_{k, \text{Pressure}}$$

Load case combination 03

$$\text{LCC 03_sls} = G_k + W_{k, \text{Pressure}} + \psi_{0, S} * S_{i, n}$$

Load case combination 04

$$\text{LCC 04_sls} = G_k + S_{i, n} + \psi_{0, w} * W_{k, \text{Pressure}}$$

Load case combination 06

$$\text{LCC 06_sls} = G_k + W_{k, \text{Suction}}$$

Max. Pressure on insulation

General information

dead load system

$$g_{\text{System}} = 0.13 \text{ kN/m}^2$$

aerodynamic coefficient

$$c_{p, \text{Pressure}} = 0.20$$

Load distribution underneath the building protection mat under Peak (45°)

Dimensions

$$75.3 \times 380.0 \times 23.1 \text{ mm}$$

$$A_{\text{eff}} = 28,614.00 \text{ mm}^2$$

$$A_{\text{load range area}} = 0.98 \text{ m}^2$$

maximum ballast

$$G_{\text{ballast required}} = 46.4 \text{ kg}$$

Load distribution underneath the building protection mat under SD (45°)

Dimensions

$$75.3 \times 380.0 \times 23.1 \text{ mm}$$

$$A_{\text{eff}} = 28,614.00 \text{ mm}^2$$

$$A_{\text{load range area}} = 0.98 \text{ m}^2$$

maximum ballast

$$G_{\text{ballast required}} = 23.1 \text{ kg}$$

Load Combinations

	$\sigma_{\text{Ek, heat insulation, S6_10}} [\text{Pa}]$	$\sigma_{\text{Ek, heat insulation, SD}} [\text{Pa}]$
Load case combination 00	20,443	12,465
Load case combination 01	33,924	25,946

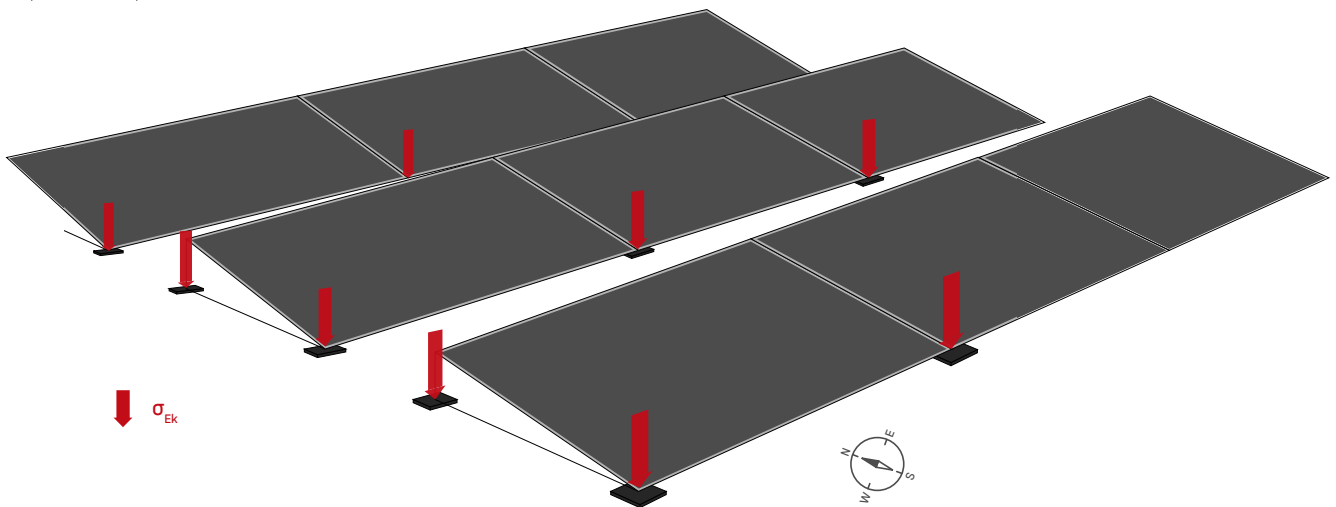


Structural analysis report | Roof 2

Dead loads (PV system + ballast)

 $\sigma_{Ek, \text{heat insulation, S6_10}}$ $\sigma_{Ek} = 20,443 \text{ Pa}$ $\sigma_{Ek, \text{heat insulation, SD}}$ $\sigma_{Ek} = 12,465 \text{ Pa}$

Maximum actions (sum of dead loads and snow)

 $\sigma_{Ek, \text{heat insulation, S6_10}}$ $\max \sigma_{Ek} = 33,924 \text{ Pa}$ $\sigma_{Ek, \text{heat insulation, SD}}$ $\max \sigma_{Ek} = 25,946 \text{ Pa}$ 

H-V-loads

According to wind tunnel report by I.F.I. Institut für Industrieaerodynamik GmbH

General information

Total number of modules

101

Roof areas covered with modules

A = ca. 295.60 m²

Dead Load

$g_{k, \text{System incl. ballast}} = 0.25 \text{ kN/m}^2$

Aerodynamic coefficients

$C_{p, \text{Pressure}}$ = according to EN 1991-1-4

$C_{F, x, \text{average}}$
d = 0.01

$C_{F, y, \text{averaged}}$ = -0.02

edge distance correction

$k_{S, lxy} = 1.00$

Parapet wall- correction coefficient

$k_p = 1.03$

Factor building height

= 1.00

Structural analysis report | Roof 2

Horizontal pressure

$$W_{k,F,x} = 0.009 \text{ kN/m}^2$$

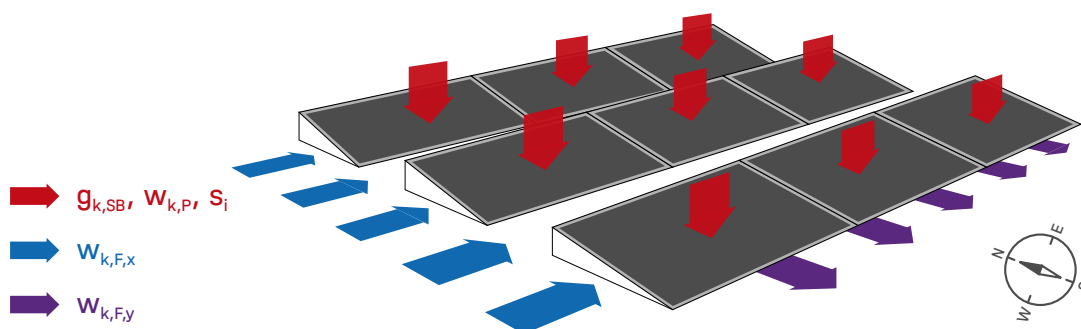
$$W_{k,F,y} = -0.018 \text{ kN/m}^2$$

Vertical pressure

$$g_{k,\text{System incl. ballast}} = 0.25 \text{ kN/m}^2$$

$$W_{k,\text{Pressure}} \quad - \text{ according to EN 1991-1-4}$$

$$s_i \quad - \text{ according to EN 1991-1-3}$$



Comment:

Flat roof vertical wind loads are essentially determined by its displacement effect and remain unchanged even with a flat pv structure. We advise using the aerodynamic coefficients according to DIN EN 1991-1-4 to calculate flat roofs.

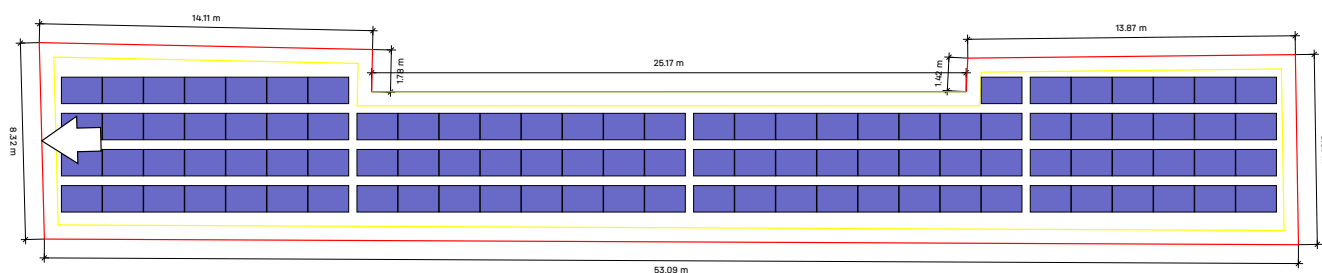


Roof 2 | Bill of material

Position	Item no.	Item description	Quantity	Weight
1	2004096	S-Dome 6.10 Base Set L	116	218.1 kg
2	2004125	Dome 6.10 Peak	116	34.8 kg
3	2004178	Dome 6 Connector 495mm Set	83	34.3 kg
4	2003249	S-Dome 6.10 Windbreaker short	101	181.8 kg
5	2002937	Thread-forming metal screw 6×25	232	1.6 kg
6	2002870	K2 Solar Cable Manager	101	0.3 kg
7	2002609	DomeClamp Black MC Set 30-50	172	10.0 kg
8	2002610	DomeClamp Black EC Set 30-50	60	4.0 kg
9	2003150	Dome Porter short	6	8.9 kg
10	1001643	MK2	12	0.2 kg
11	2001729	Socket Head Bolt serrated M8×20	12	0.2 kg
12	2002300	Dome SpeedPorter	328	24.9 kg
Total				518.9 kg

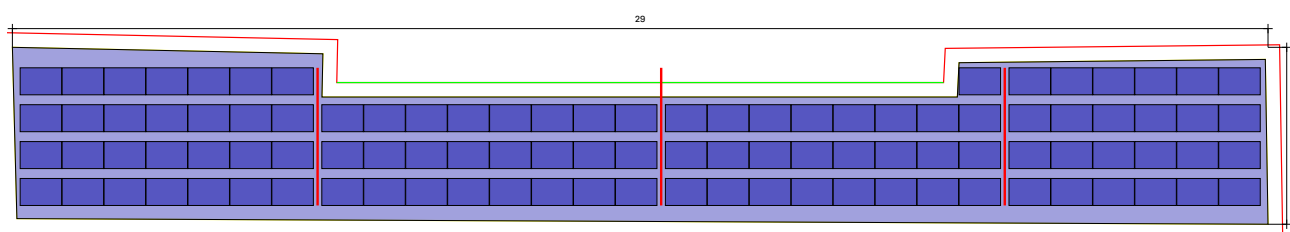


Roof 3



Roof	System	Module	Height	Quantity	Total power
Roof 3  Flat	S-Dome 6.10 Xpress	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	22.00 m	101	43.43 kWp

Roof 3 | Module array 1



Roof ③ Module array ①

Mounting System

[S-Dome 6.10 Xpress](#)

Module

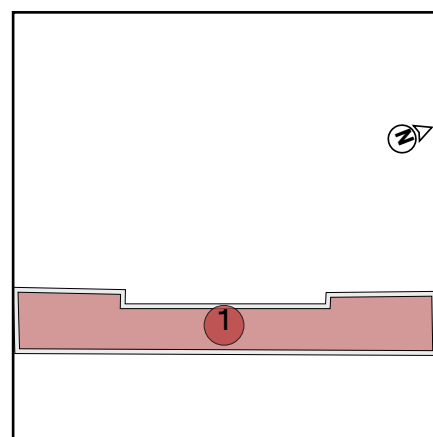
101(43.43 kWp) x DAS-DH108NA-430 (SchwarzThru)

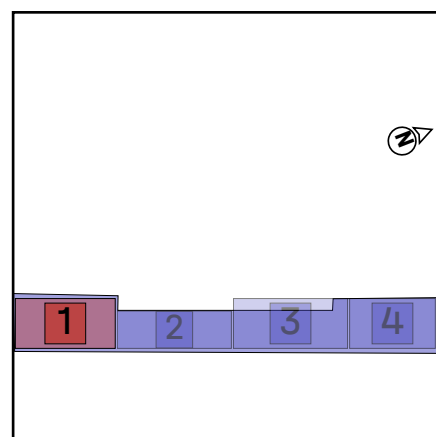
Row spacing

1.53 m

service corridor

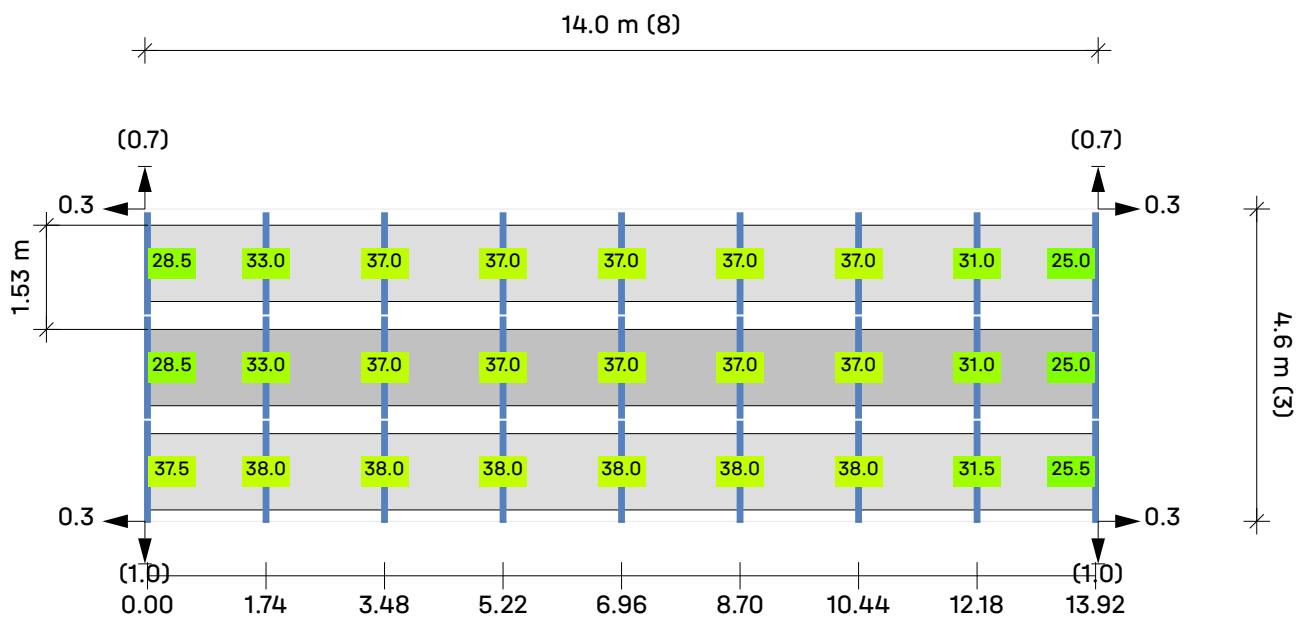
0.41 m







Roof 3 | Module array 1 | Module blocks

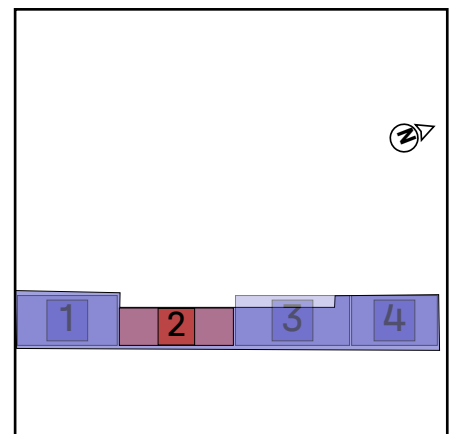


Roof ③ Module array ① Module block ②

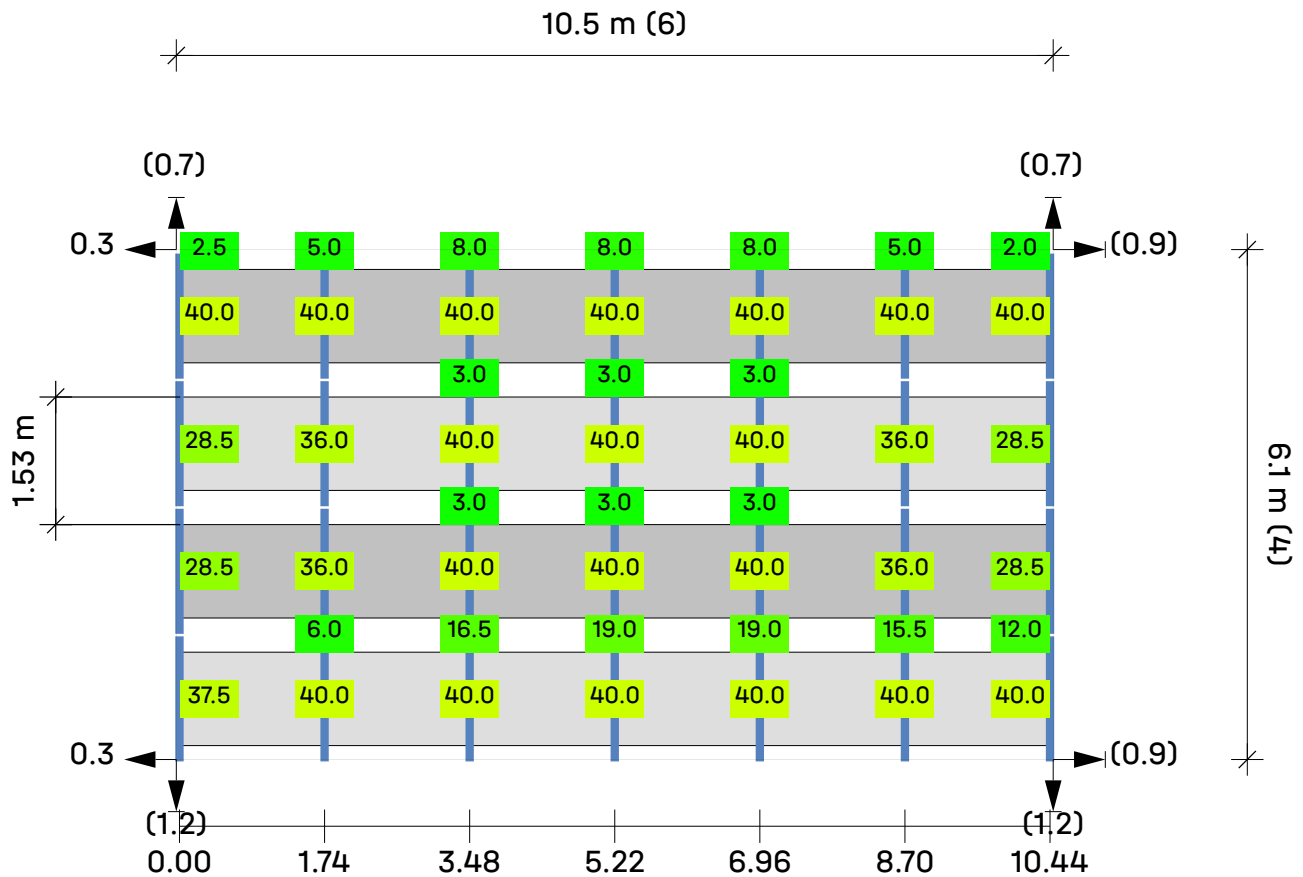
Modules $8 \times 3 = 24$

Legend

- Mounting rail
- Row distance [m]
- Distance to Roof Edge [m]
- Dist. to neighbour module block/array [m]
- 25 Ballast in kilogram (kg)
- Porter Ballast



Roof 3 | Module array 1 | Module blocks

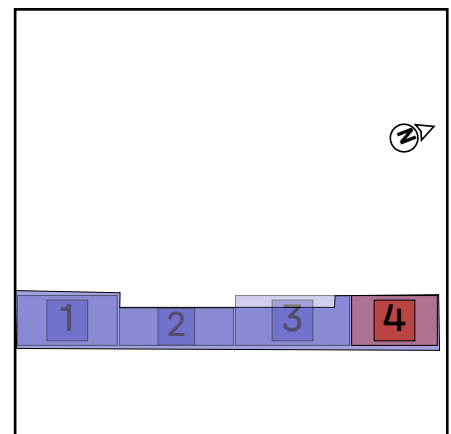


Roof ③ Module array ① Module block ④

Modules $6 \times 4 = 24$

Legend

- Mounting rail
- Row distance [m]
- Distance to Roof Edge [m]
- Dist. to neighbour module block/array [m]
- 25 Ballast in kilogram (kg)
- Porter Ballast





Results | Roof 3

Roof	System	Module	Height	Quantity	Total power
Roof 3  Flat	S-Dome 6.10 Xpress	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	22.00 m	101	43.43 kWp

Module

Name	DAS-DH108NA-430 (SchwarzThru)
Manufacturer	DAS Solar (Quzhou) Co., Ltd.
Output power	430 Wp
Dimensions	1,722×1,134×30 mm
Weight	20.5 kg

Module clamps

module clamp	DomeClamp Black MC Set 30-50
end clamp	DomeClamp Black EC Set 30-50

Ballast capacity

Speed Porter	40.0 kg
Porter	108.0 kg

Verification system utilisation

Type	pressure	suction
Verification system utilisation	63.41%	66.72%
Loads on modules (ultimate state)	2.41 kN/m ²	-1.85 kN/m ²
Loads on modules (Serviceability)	1.47 kN/m ²	-1.09 kN/m ²

Specific loads

Module block	No. of modules	Ballast [kg]	Dead weight [kg]	Module block area [m ²] (incl. service corridor)	Dead Load [kN/m ²]	Dead load (roof surface area) [kN/m ²]
Block 1	28	1,361.0	2,103.00	74.95 m ²	0.28	
Block 2	24	927.5	1,563.50	64.17 m ²	0.24	
Block 3	25	1,048.0	1,710.50	66.95 m ²	0.25	
Block 4	24	1,200.0	1,836.00	64.31 m ²	0.28	
Total	101	4,536.5	7,213.00			0.18

Results | Roof 3

Important Information

- The static equilibrium and load-bearing capacity of the system is verified by checking the load cases of uplift and downforce due to wind in accordance with the expert opinion of Ruscheweyh Consult GmbH.
- You will find a short version of the wind tunnel report and a certificate for the further static calculations on our homepage.
- The structure was statically verified in accordance with Eurocode 9: Design of aluminium structures (DIN EN 1999-1-1:2021) and offers sufficient load-bearing capacity and stability for the loads specified in the chapter 'Maximum actions on the components'.
- Adjustment factor for wind load regarding service life period, f_W , is according to DIN EN 1991-1-4/ NA, NDP for 4.2 (2P) note 5, table 3
- Adjustment factor for snow load regarding service life period, f_S , is according to DIN EN 1991-1-3/ annex D, table 4
- All resistance values of components are determined from an extern static engineering office.
- The structural design complies with BS EN 1990 - Basis of Structural Design.
- Snow loads are determined in accordance with National Annex BS NA EN 1991-1-3 (2018) - UK National Annex to EC1 - Action on structures - general actions - snow loads.
- Wind loads are determined in accordance with National Annex BS NA EN 1991-1-4 - UK National Annex to EC1 - Action on structures, general actions - wind actions.
- 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'.
- The person responsible for the execution of the work must check the load assumptions made with the conditions on site. If deviations are found, the person who prepared the static calculation must be consulted immediately. , in particular § 2 ("technical and specialist requirements for the customer"), § 7 ("warranty provisions") and § 8 ("limitation of liability").

Structural analysis report | Roof 3

General information

Name	New project
Mounting System	S-Dome 6.10 Xpress
Author	james wynne

Location information

Address	Warrington Rd, Rainhill, Prescot L35 5DR, UK
Ground elevation	64.79 m

Roof information

Building height	22.00 m
Roof type	Flat roof
Roof pitch	2°
Fastening method	with Ballast
Roof covering	Flat
Min. roof edge distance	0.60 m
Parapet wall height	0.50 m
Material	Concrete
Friction coefficient	1

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	BS EN
Failure consequence class (CC)	CC3
Design working life	25 years
Terrain category	Town Terrain
Distance to shoreline	18.00 km
Distance inside town terrain	1.00 km

Wind load

Velocity pressure, 50 years	$q_{p,50} = 1.078 \text{ kN/m}^2$
Adjustment factor for service life	$f_w = 1.000$
Velocity pressure, 25 years	$q_{p,25} = 0.993 \text{ kN/m}^2$



Structural analysis report | Roof 3

Snow load

Snow load zone	3
Snow guard	No
Snow load on ground level	$s_k = 0.500 \text{ kN/m}^2$
Shape Coefficient for Snow	$\mu_i = 0.800$
Factor for roof pitch	$d_i = 0.999$
Snow load on roof, 50 year	$s_{i,50} = 0.400 \text{ kN/m}^2$
Adjustment factor for service life	$f_s = 1.000$
Snow load on roof, 25 years	$s_{i,25} = 0.371 \text{ kN/m}^2$

Dead Load

Weight of module	$G_M = 20.5 \text{ kg}$
Weight of mounting system per module	$= 6.0 \text{ kg}$
Module area	$A_M = 1.95 \text{ m}^2$
Dead weight of module per m^2	$= 10.50 \text{ kg/m}^2$
Dead weight of mounting system per m^2	$= 3.07 \text{ kg/m}^2$
Total Dead Load (excl. ballast) per m^2	$= 0.13 \text{ kN/m}^2$

Load Combinations

Ultimate limit state

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 variable loads	$\gamma_Q = 1.50$
Combination coefficient with regards to wind	$\psi_{0,W} = 0.60$
Combination coefficient with regards to Snow	$\psi_{0,S} = 0.50$
Importance factor permanent	$\kappa_{FI,G} = 1.10$
Importance factor variable	$\kappa_{FI,Q} = 1.10$
Characteristic dead weight	G_k
Characteristic snow load on the roof	$S_{i,n}$
Characteristic wind load	W_k

Load case combination 01	$LCC\ 01_{uls} = \gamma_{G,sup} * \kappa_{FI,G} * G_k + \gamma_Q * \kappa_{FI,Q} * S_{i,n}$
Load case combination 02	$LCC\ 02_{uls} = \gamma_{G,sup} * \kappa_{FI,G} * G_k + \gamma_Q * \kappa_{FI,Q} * W_{k,Pressure}$
Load case combination 03	$LCC\ 03_{uls} = \gamma_{G,sup} * \kappa_{FI,G} * G_k + \gamma_Q * \kappa_{FI,Q} * (W_{k,Pressure} + \psi_{0,S} * S_{i,n})$
Load case combination 04	$LCC\ 04_{uls} = \gamma_{G,sup} * \kappa_{FI,G} * G_k + \gamma_Q * \kappa_{FI,Q} * (S_{i,n} + \psi_{0,W} * W_{k,Pressure})$
Load case combination 06	$LCC\ 06_{uls} = \gamma_{G,inf} * G_k + \gamma_Q * \kappa_{FI,Q} * W_{k,Suction}$



Structural analysis report | Roof 3

Static equilibrium

Uplift Verification

$$\text{LCC up} = \gamma_{G, \text{stb}} * G_k + \gamma_Q * K_{F1, Q} * W_{k, n, \text{Uplift}}$$

Displacement verification

$$\text{LCC displ} = \gamma_{G, \text{stb}} * G_k + \gamma_Q * K_{F1, Q} * W_{k, n, \text{Displacement}}$$

Serviceability limit state

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 01

$$\text{LCC 01_sls} = G_k + S_{i, n}$$

Load case combination 02

$$\text{LCC 02_sls} = G_k + W_{k, \text{Pressure}}$$

Load case combination 03

$$\text{LCC 03_sls} = G_k + W_{k, \text{Pressure}} + \psi_{0, S} * S_{i, n}$$

Load case combination 04

$$\text{LCC 04_sls} = G_k + S_{i, n} + \psi_{0, w} * W_{k, \text{Pressure}}$$

Load case combination 06

$$\text{LCC 06_sls} = G_k + W_{k, \text{Suction}}$$

Max. Pressure on insulation

General information

dead load system

$$g_{\text{System}} = 0.13 \text{ kN/m}^2$$

aerodynamic coefficient

$$C_{p, \text{Pressure}} = 0.20$$

Load distribution underneath the building protection mat under Peak (45°)

Dimensions

$$75.3 \times 380.0 \times 23.1 \text{ mm}$$

$$A_{\text{eff}} = 28,614.00 \text{ mm}^2$$

$$A_{\text{load range area}} = 0.98 \text{ m}^2$$

maximum ballast

$$G_{\text{ballast required}} = 45.4 \text{ kg}$$

Load distribution underneath the building protection mat under SD (45°)

Dimensions

$$75.3 \times 380.0 \times 23.1 \text{ mm}$$

$$A_{\text{eff}} = 28,614.00 \text{ mm}^2$$

$$A_{\text{load range area}} = 0.98 \text{ m}^2$$

maximum ballast

$$G_{\text{ballast required}} = 13.6 \text{ kg}$$

Load Combinations

	$\sigma_{\text{Ek, heat insulation, S6_10}} [\text{Pa}]$	$\sigma_{\text{Ek, heat insulation, SD}} [\text{Pa}]$
Load case combination 00	20,101	9,202
Load case combination 01	33,582	22,683



Structural analysis report | Roof 3

Dead loads (PV system + ballast)

 $\sigma_{Ek, \text{heat insulation, S6_10}}$

$$\sigma_{Ek} = 20,101 \text{ Pa}$$

 $\sigma_{Ek, \text{heat insulation, SD}}$

$$\sigma_{Ek} = 9,202 \text{ Pa}$$

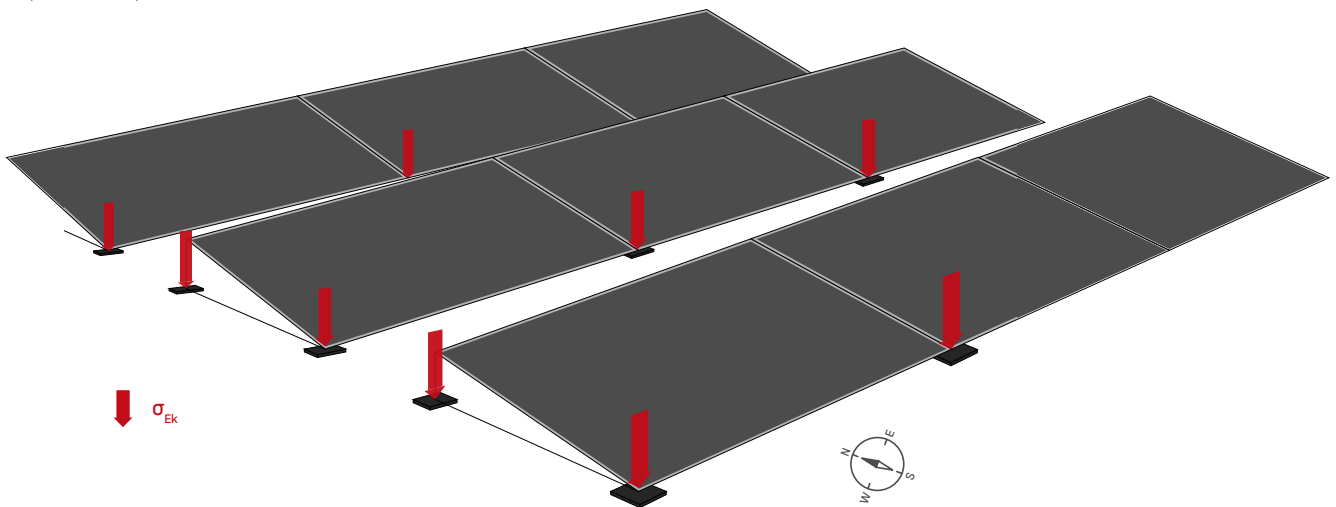
Maximum actions (sum of dead loads and snow)

 $\sigma_{Ek, \text{heat insulation, S6_10}}$

$$\max \sigma_{Ek} = 33,582 \text{ Pa}$$

 $\sigma_{Ek, \text{heat insulation, SD}}$

$$\max \sigma_{Ek} = 22,683 \text{ Pa}$$



H-V-loads

According to wind tunnel report by I.F.I. Institut für Industrieaerodynamik GmbH

General information

Total number of modules

101

Roof areas covered with modules

A = ca. 270.37 m²

Dead Load

$g_{k, \text{System incl. ballast}} = 0.26 \text{ kN/m}^2$

Aerodynamic coefficients

$C_{p, \text{Pressure}}$ = according to EN 1991-1-4

$C_{F, x, \text{average}}$
d = 0.01

$C_{F, y, \text{averaged}}$ = -0.02

edge distance correction

$k_{S, lxy} = 1.00$

Parapet wall- correction coefficient

$k_p = 1.03$

Factor building height

= 1.00

Structural analysis report | Roof 3

Horizontal pressure

$$W_{k,F,x} = 0.009 \text{ kN/m}^2$$

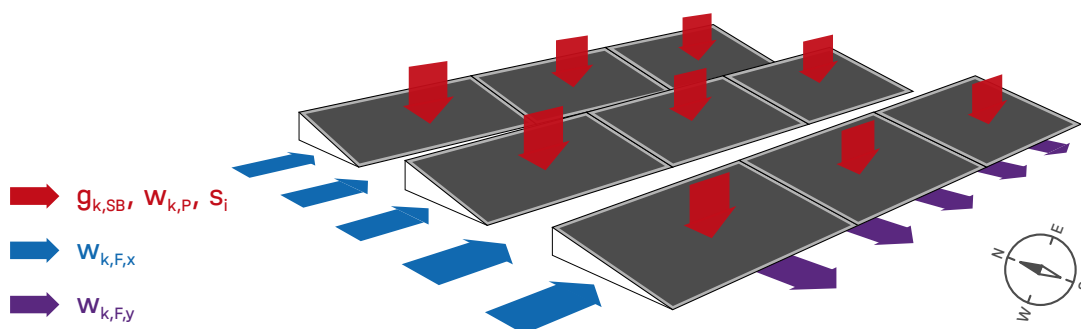
$$W_{k,F,y} = -0.018 \text{ kN/m}^2$$

Vertical pressure

$$g_{k,\text{System incl. ballast}} = 0.26 \text{ kN/m}^2$$

$$W_{k,\text{Pressure}} \quad - \text{ according to EN 1991-1-4}$$

$$s_i \quad - \text{ according to EN 1991-1-3}$$



Comment:

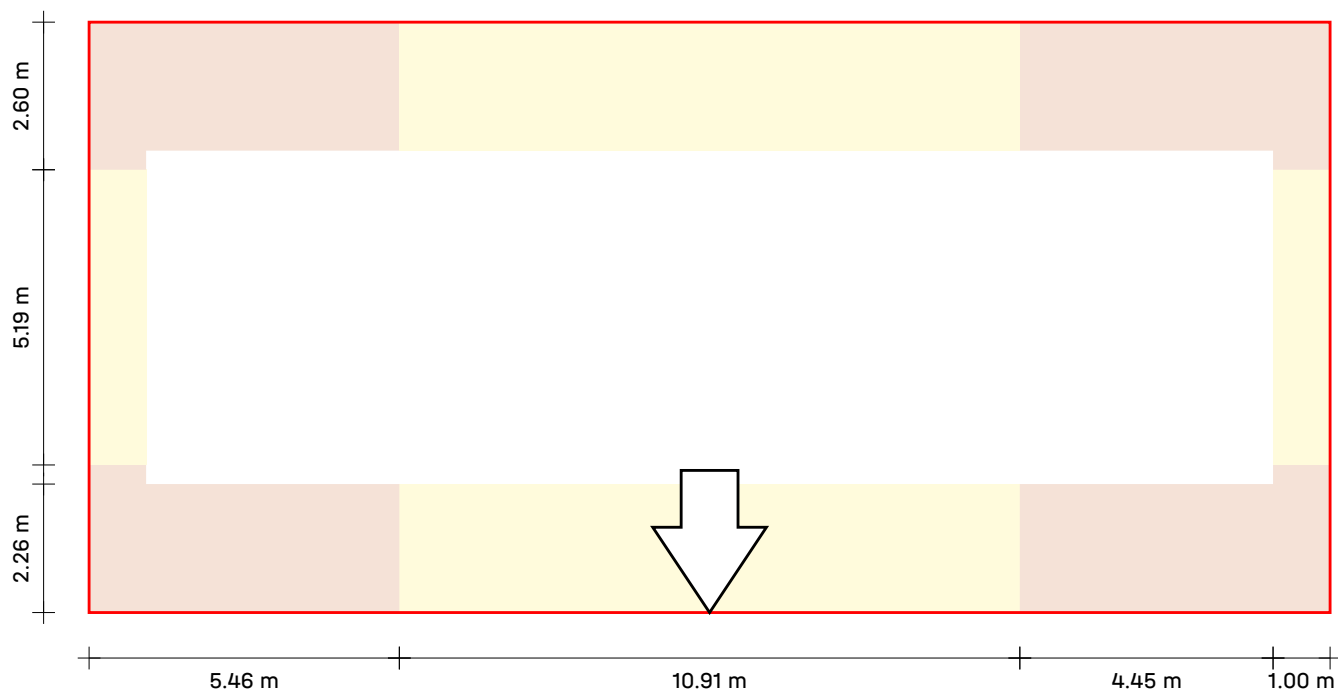
Flat roof vertical wind loads are essentially determined by its displacement effect and remain unchanged even with a flat pv structure. We advise using the aerodynamic coefficients according to DIN EN 1991-1-4 to calculate flat roofs.



Roof 3 | Bill of material

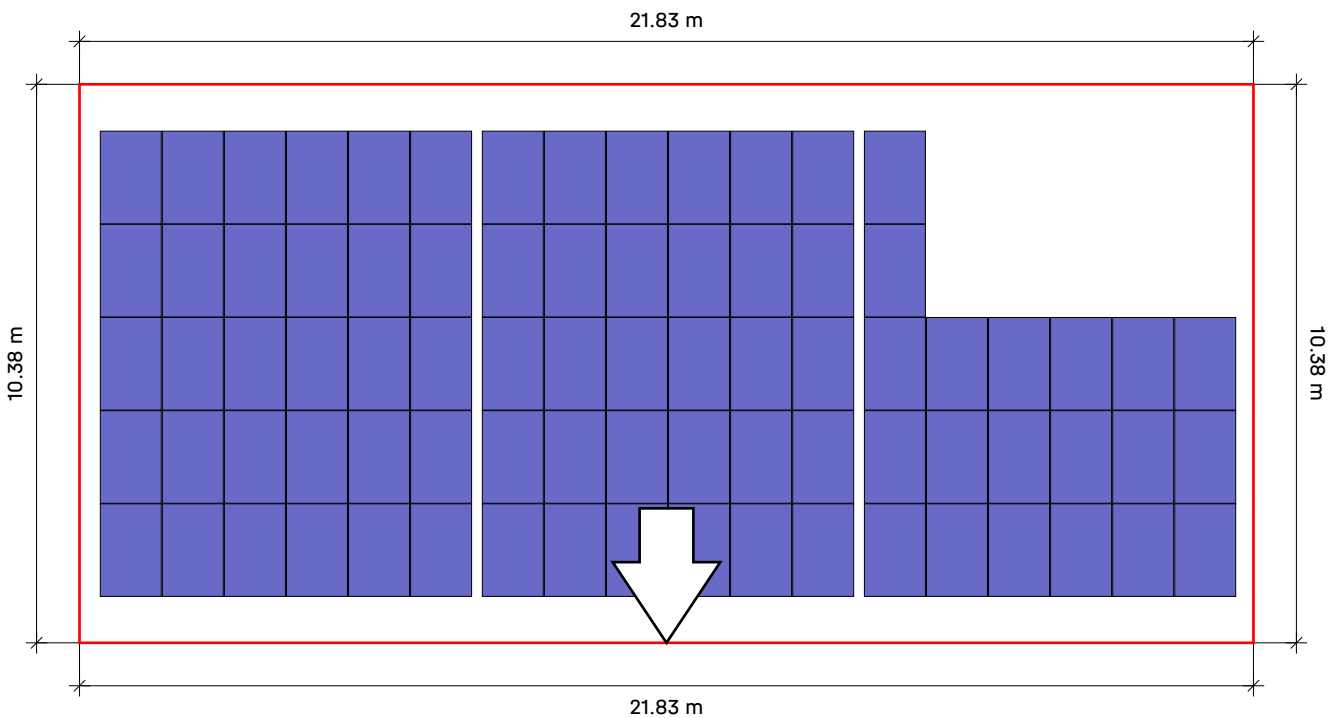
Position	Item no.	Item description	Quantity	Weight
1	2004096	S-Dome 6.10 Base Set L	116	218.1 kg
2	2004125	Dome 6.10 Peak	116	34.8 kg
3	2004123	Dome 6 Connector 195 Set	83	17.9 kg
4	2003249	S-Dome 6.10 Windbreaker short	101	181.8 kg
5	2002937	Thread-forming metal screw 6×25	232	1.6 kg
6	2002870	K2 Solar Cable Manager	101	0.3 kg
7	2002609	DomeClamp Black MC Set 30-50	172	10.0 kg
8	2002610	DomeClamp Black EC Set 30-50	60	4.0 kg
9	2002300	Dome SpeedPorter	324	24.6 kg
Total				493.1 kg

Roof 5





Roof 5



Roof	System	Module	Height	Quantity	Total power
<u>Roof 5</u>	<u>K2 BasicRail</u>	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	20.00 m	80	34.4 kWp
 Trapezoidal					



Roof 5 | Assembly plan

Base Rails

Type	Whole Rails		Rail cutting		
	Total Rail Length	Quantity 3.65 m	Part of Rail / Rest	Length	Rest
26* A	7.024 m	1*3.65 m	3.650	3.374 from 3.650	0.266
2*B	1.254 m		3.650	1.254 from 3.650	<u>2.386</u>
2*C	1.254 m		<u>2.386</u>	1.254 from 2.386	1.122

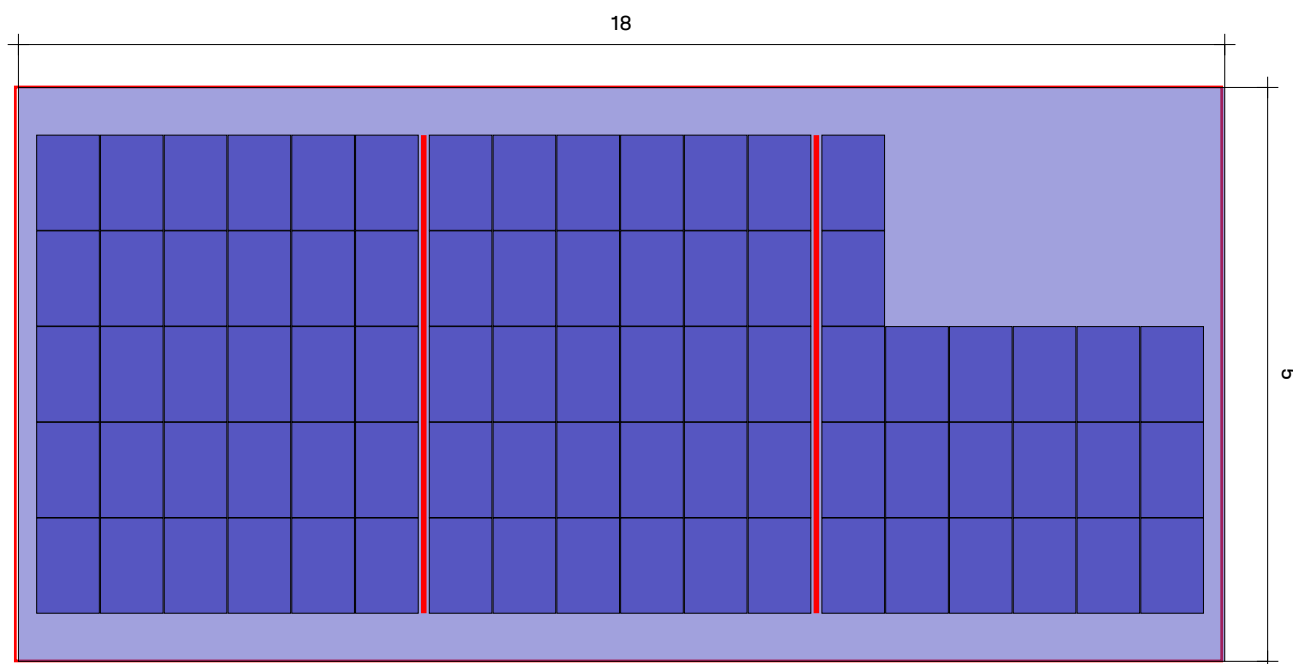
1 cm is viewed as lost for each cutting

Red numbers are leftover rails which will not be used any longer

Module arrays

Module array	Width[m]	Length[m]	Width in modules	Length in modules
1	21.11	8.65	18	5

Roof 5 | Module array 1



Roof ④ Module array ①

Mounting System

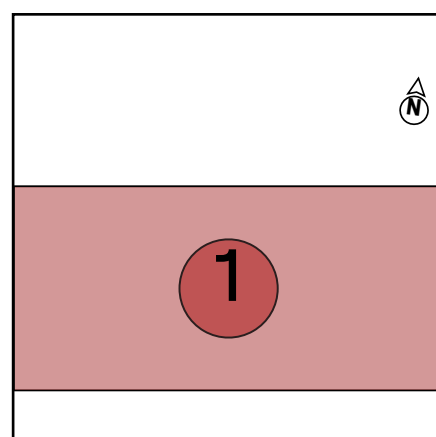
[K2 BasicRail](#)

Module

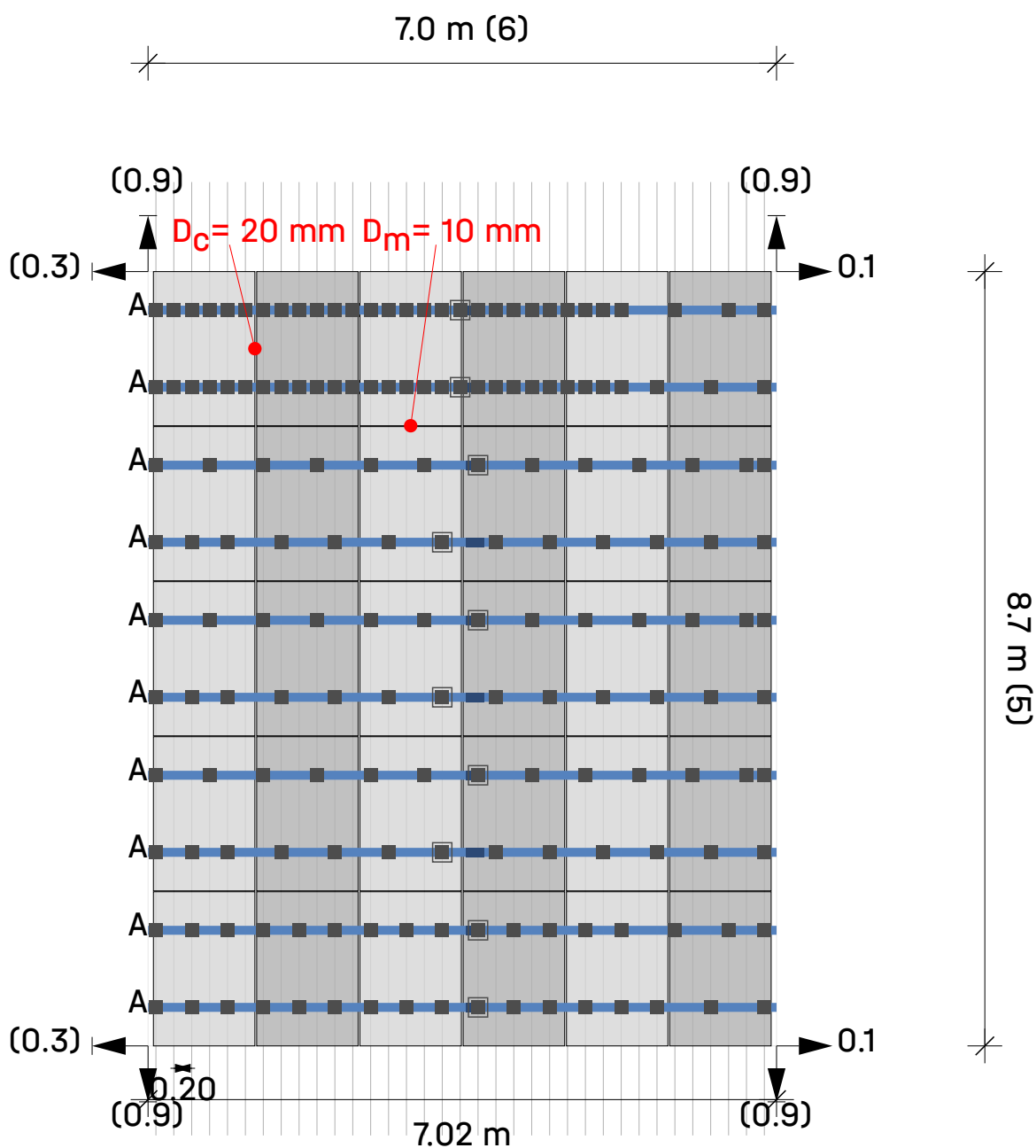
80(34.4 kWp) x DAS-DH108NA-430 (SchwarzThru)

Row spacing

1.73 m



Roof 5 | Module array 1 | Module blocks

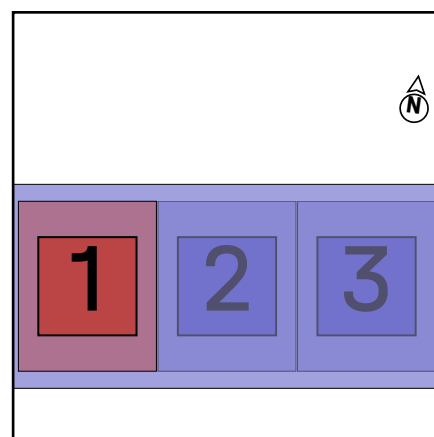


Roof ④ Module array ① Module block 1

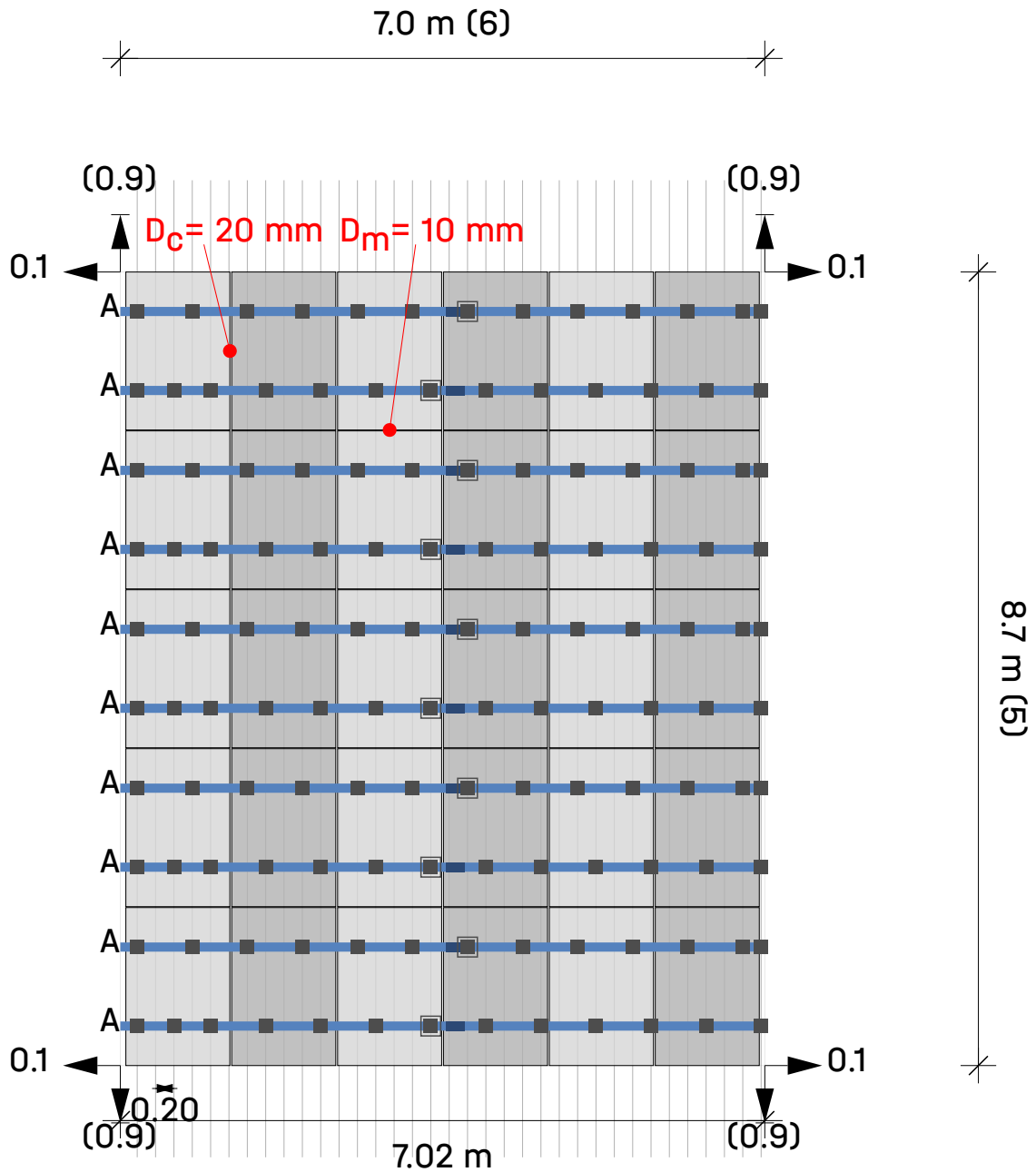
Modules $6 \times 5 = 30$

Legend

- Fastener
- BasicLocks
- Mounting rail: K2 BasicRail 22
- Dist. to neighbour module block/array [m]
- D_c Distance for clamping between modules
- D_m Distance between modules



Roof 5 | Module array 1 | Module blocks

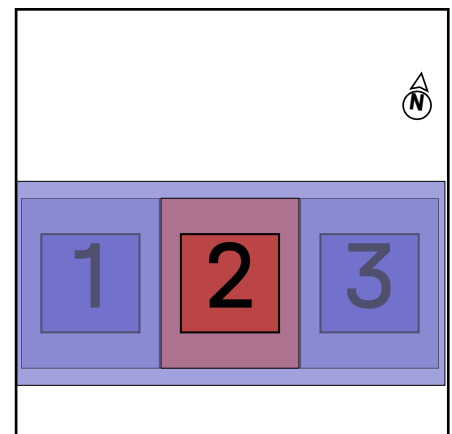


Roof ④ Module array ① Module block ②

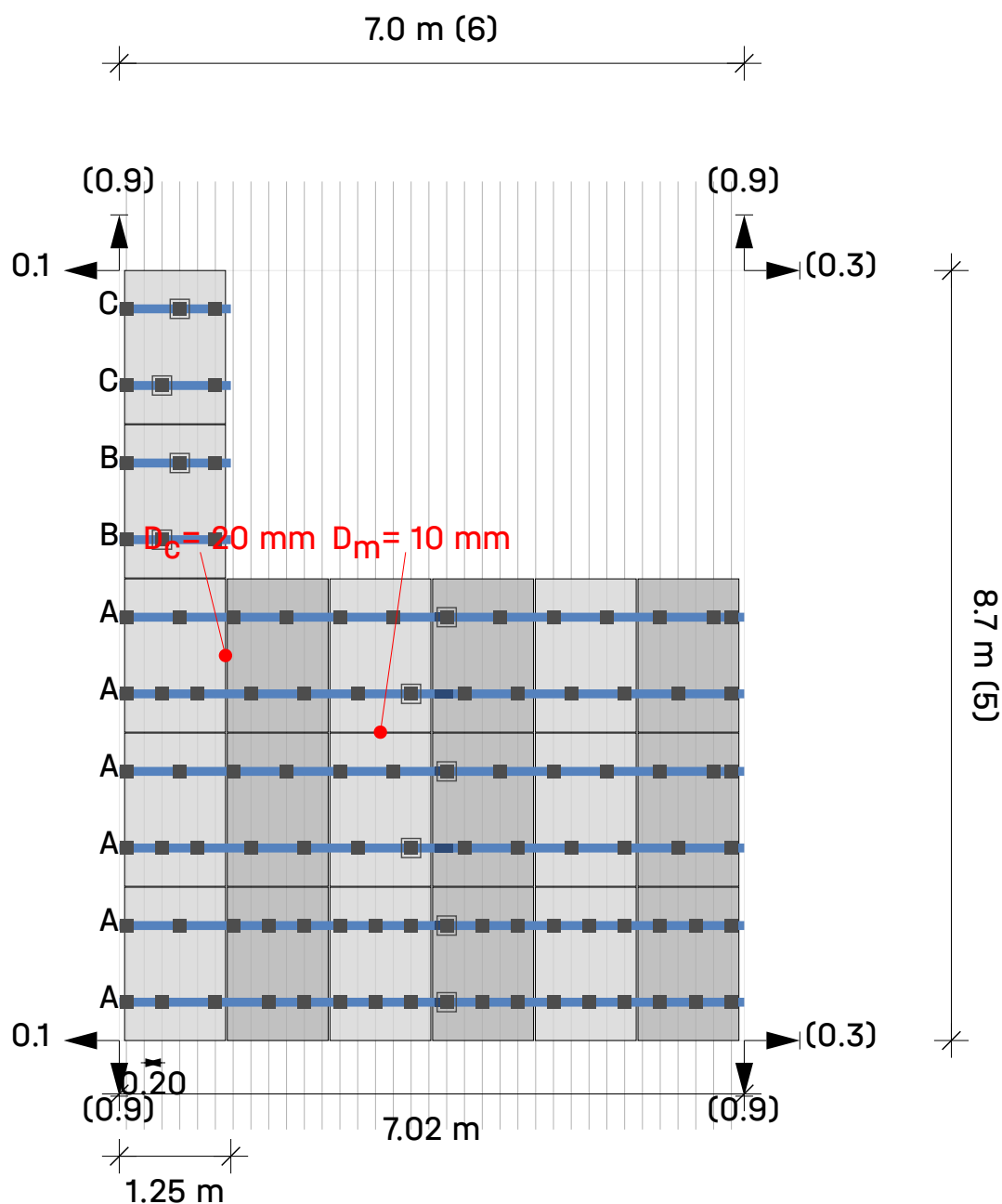
Modules $6 \times 5 = 30$

Legend

- Fastener
- BasicLocks
- Mounting rail: K2 BasicRail 22
- ➔ Dist. to neighbour module block/array [m]
- D_c Distance for clamping between modules
- D_m Distance between modules



Roof 5 | Module array 1 | Module blocks

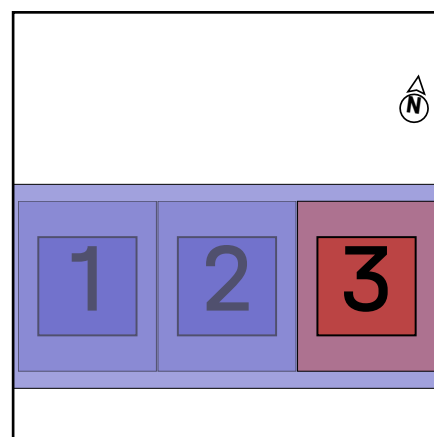


Roof ④ Module array ① Module block ③

Modules $(6 \times 5) - 10 = 20$

Legend

- Fastener
- BasicLocks
- Mounting rail: K2 BasicRail 22
- ➔ Dist. to neighbour module block/array [m]
- D_c Distance for clamping between modules
- D_m Distance between modules





Results | Roof 5

Roof	System	Module	Height	Quantity	Total power
<u>Roof 5</u>  Trapezoidal	<u>K2 BasicRail</u>	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	20.00 m	80	34.4 kWp

Module

Name	DAS-DH108NA-430 (SchwarzThru)
Manufacturer	DAS Solar (Quzhou) Co., Ltd.
Output power	430 Wp
Dimensions	1,722×1,134×30 mm
Weight	20.5 kg

Components

Fastener	K2 BasicClip
Base rails	K2 BasicRail 22
Metal screw	Thread-forming metal screw 6.0×38

Loads on modules (module dimensioning)

Array	A-TrA [m²]	ultimate state [Pa]				Serviceability [Pa]			
		Pressure ⊥	Pressure ∥	Uplift ⊥	Uplift ∥	Pressure ⊥	Pressure ∥	Uplift ⊥	Uplift ∥
field area	1.95	926.3	196.7	-1,332.3	29.2	572.3	122.1	-764.5	29.2
eaves	1.95	926.3	196.7	-1,332.3	29.2	572.3	122.1	-764.5	29.2
corner region (eave)	1.95	926.3	196.7	-2,453.5	29.2	572.3	122.1	-1,444.0	29.2
gableboard	1.95	926.3	196.7	-1,652.7	29.2	572.3	122.1	-958.6	29.2
corner region (ridge)	1.95	926.3	196.7	-4,055.1	29.2	572.3	122.1	-2,414.6	29.2
ridge	1.95	926.3	196.7	-1,492.5	29.2	572.3	122.1	-861.5	29.2



Results | Roof 5

Utilisation result

No.	Module Array	roof areas	ultimate limit state			Usab.	Distances		maximum values	
			Pr σ [%]	CL σ [%]	Fst F[%]	Pr f[%]	Fst [m]	BR [m]	CL L_{max} [m]	Fst D _{max} [m]
1		field area	21.2	10.0	75.8	13.6	0.600	---	0.454	0.792
1		eaves	21.2	10.0	75.8	13.6	0.600	---	0.454	0.792
1		corner region (eave)	17.3	11.2	92.0	5.1	0.400	---	0.400	0.435
1		gableboard	26.3	7.6	93.6	17.1	0.600	---	0.427	0.641
1		corner region (ridge)	7.1	6.9	75.7	1.1	0.200	---	0.200	0.264
1		ridge	23.8	11.2	84.7	15.4	0.600	---	0.440	0.709

Pr	Profile	Fst D _{max}	maximum fastener spacing
Fst	Fastener	BR	Base Rail
σ	Stress	Usab.	serviceability limit state
f	Deflection	CL	Cantilever
F	Force		
CL/L _{max}	maximum cantilever length		



Results | Roof 5

Important Information

- The quantity for K2 BasicRail BasicClips is calculated in such a way, that - according to the Assembly Instructions - a BasicClip can be installed on the crest to the left and right of a Rail Connector Set.
- The structure was statically verified in accordance with Eurocode 9: Design of aluminium structures (DIN EN 1999-1-1:2021) and offers sufficient load-bearing capacity and stability for the loads specified in the chapter 'Maximum actions on the components'.
- Adjustment factor for wind load regarding service life period, f_W , is according to DIN EN 1991-1-4/ NA, NDP for 4.2 (2P) note 5, table 3
- Adjustment factor for snow load regarding service life period, f_S , is according to DIN EN 1991-1-3/ annex D, table 4
- The structural design complies with BS EN 1990 - Basis of Structural Design.
- Snow loads are determined in accordance with National Annex BS NA EN 1991-1-3 (2018) - UK National Annex to EC1 - Action on structures - general actions - snow loads.
- Wind loads are determined in accordance with National Annex BS NA EN 1991-1-4 - UK National Annex to EC1 - Action on structures, general actions - wind actions.
- 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'.
- The person responsible for the execution of the work must check the load assumptions made with the conditions on site. If deviations are found, the person who prepared the static calculation must be consulted immediately. , in particular § 2 ("technical and specialist requirements for the customer"), § 7 ("warranty provisions") and § 8 ("limitation of liability").



Structural analysis report | Roof 5

General information

Name	New project
Mounting System	K2 BasicRail
Author	james wynne

Location information

Address	Warrington Rd, Rainhill, Prescot L35 5DR, UK
Ground elevation	64.79 m

Roof information

Building height	20.00 m
Roof type	Monopitch roof
Roof pitch	15°
Roof covering	Trapezoidal
Min. roof edge distance	0.00 m
Crest distance	200.0 mm
Crest width	22.0 mm
Crest height	40.0 mm
Roof material	Steel
Sheet quality	S235
Sheet thickness	0.500 mm

Loads

Design method	BS EN
Failure consequence class (CC)	CC3
Design working life	25 years
Terrain category	Town Terrain
Distance to shoreline	18.00 km
Distance inside town terrain	1.00 km

Wind load

Velocity pressure, 50 years	$q_{p,50} = 1.054 \text{ kN/m}^2$
Adjustment factor for service life	$f_w = 1.000$
Velocity pressure, 25 years	$q_{p,25} = 0.971 \text{ kN/m}^2$

Structural analysis report | Roof 5

Roof areas

Array	load impact area [m ²]	maxCpe ₁₀	minCpe ₁₀	wind pressure [kN/m ²]	wind suction [kN/m ²]
field area	10.00	0.200	-0.900	0.194	-0.874
eaves	10.00	0.200	-0.900	0.194	-0.874
corner region (eave)	10.00	0.200	-1.600	0.194	-1.553
gableboard	10.00	0.200	-1.100	0.194	-1.068
corner region (ridge)	10.00	0.200	-2.600	0.194	-2.524
ridge	10.00	0.200	-1.000	0.194	-0.971

Snow load

Snow load zone	3
Snow guard	No
Snow load on ground level	$s_k = 0.500 \text{ kN/m}^2$
Shape Coefficient for Snow	$\mu_i = 0.800$
Factor for roof pitch	$d_i = 0.966$
Snow load on roof, 50 year	$s_{i,50} = 0.386 \text{ kN/m}^2$
Adjustment factor for service life	$f_s = 1.000$
Snow load on roof, 25 years	$s_{i,25} = 0.359 \text{ kN/m}^2$

Dead Load

Weight of module	$G_M = 20.5 \text{ kg}$
Weight of mounting system per module	$= 2.0 \text{ kg}$
Module area	$A_M = 1.95 \text{ m}^2$
Dead weight of module per m ²	$= 10.50 \text{ kg/m}^2$
Dead weight of mounting system per m ²	$= 1.02 \text{ kg/m}^2$
Total Dead Load (excl. ballast) per m ²	$= 0.11 \text{ kN/m}^2$

Structural analysis report | Roof 5

Load Combinations

Ultimate limit state

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 variable loads	$\gamma_Q = 1.50$
Combination coefficient with regards to wind	$\psi_{0,W} = 0.60$
Combination coefficient with regards to Snow	$\psi_{0,S} = 0.50$
Importance factor permanent	$\kappa_{Fl,G} = 1.10$
Importance factor variable	$\kappa_{Fl,Q} = 1.10$
Characteristic dead weight	G_k
Characteristic snow load on the roof	$S_{i,n}$
Characteristic wind load	W_k

Load case combination 01	$LCC\ 01_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * S_{i,n}$
Load case combination 02	$LCC\ 02_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,Pressure}$
Load case combination 03	$LCC\ 03_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * (W_{k,Pressure} + \psi_{0,S} * S_{i,n})$
Load case combination 04	$LCC\ 04_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * (S_{i,n} + \psi_{0,W} * W_{k,Pressure})$
Load case combination 06	$LCC\ 06_{uls} = \gamma_{G,inf} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,Suction}$

Serviceability limit state

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 01	$LCC\ 01_{sls} = G_k + S_{i,n}$
Load case combination 02	$LCC\ 02_{sls} = G_k + W_{k,Pressure}$
Load case combination 03	$LCC\ 03_{sls} = G_k + W_{k,Pressure} + \psi_{0,S} * S_{i,n}$
Load case combination 04	$LCC\ 04_{sls} = G_k + S_{i,n} + \psi_{0,W} * W_{k,Pressure}$
Load case combination 06	$LCC\ 06_{sls} = G_k + W_{k,Suction}$

Structural analysis report | Roof 5

Maximum load on modules (Mounting system dimensioning)

Array	A-TrA [m ²]	ultimate state [kN/m ²]				Serviceability [kN/m ²]			
		Pressure ⊥	Pressure 	Uplift ⊥	Uplift	Pressure ⊥	Pressure 	Uplift ⊥	Uplift
field area	10.00	0.926	0.197	-1.332	0.029	0.572	0.122	-0.764	0.029
eaves	10.00	0.926	0.197	-1.332	0.029	0.572	0.122	-0.764	0.029
corner region (eave)	10.00	0.926	0.197	-2.453	0.029	0.572	0.122	-1.444	0.029
gableboard	10.00	0.926	0.197	-1.653	0.029	0.572	0.122	-0.959	0.029
corner region (ridge)	10.00	0.926	0.197	-4.055	0.029	0.572	0.122	-2.415	0.029
ridge	10.00	0.926	0.197	-1.492	0.029	0.572	0.122	-0.862	0.029

Max. load on fastener

Array	A-TrA [m ²]	ultimate state [kN]				Serviceability [kN]			
		Pressure ⊥	Pressure 	Uplift ⊥	Uplift	Pressure ⊥	Pressure 	Uplift ⊥	Uplift
field area	10.00	0.526	0.112	-0.757	0.017	0.325	0.069	-0.434	0.017
eaves	10.00	0.526	0.112	-0.757	0.017	0.325	0.069	-0.434	0.017
corner region (eave)	10.00	0.351	0.075	-0.929	0.011	0.217	0.046	-0.547	0.011
gableboard	10.00	0.526	0.112	-0.939	0.017	0.325	0.069	-0.545	0.017
corner region (ridge)	10.00	0.175	0.037	-0.768	0.006	0.108	0.023	-0.457	0.006
ridge	10.00	0.526	0.112	-0.848	0.017	0.325	0.069	-0.490	0.017

Resistance Values of Components

Base Rails

Base Rails	A [cm ²]	I _y [cm ⁴]	I _z [cm ⁴]	W _y [cm ³]	W _z [cm ³]
K2 BasicRail 22	2.380	1.52	7.74	1.08	2.46

Fastener

Fastener	R _{D,Uplift,Perpendicular} [kN]	R _{D,Pressure,Perpendicular} [kN]	R _{D,Pressure,Parallel} [kN]
K2 BasicClip	1.02	-	0.96
Thread-forming metal screw 6.0×38	0.65	-	0.62



Structural analysis report | Roof 5

Utilisation result

No.	Module Array	roof areas	ultimate limit state			Usab.	Distances		maximum values	
			Pr σ [%]	CL σ [%]	Fst F[%]	Pr f[%]	Fst [m]	BR [m]	CL L_{max} [m]	Fst D _{max} [m]
1		field area	21.2	10.0	75.8	13.6	0.600	---	0.454	0.792
1		eaves	21.2	10.0	75.8	13.6	0.600	---	0.454	0.792
1		corner region (eave)	17.3	11.2	92.0	5.1	0.400	---	0.400	0.435
1		gableboard	26.3	7.6	93.6	17.1	0.600	---	0.427	0.641
1		corner region (ridge)	7.1	6.9	75.7	1.1	0.200	---	0.200	0.264
1		ridge	23.8	11.2	84.7	15.4	0.600	---	0.440	0.709

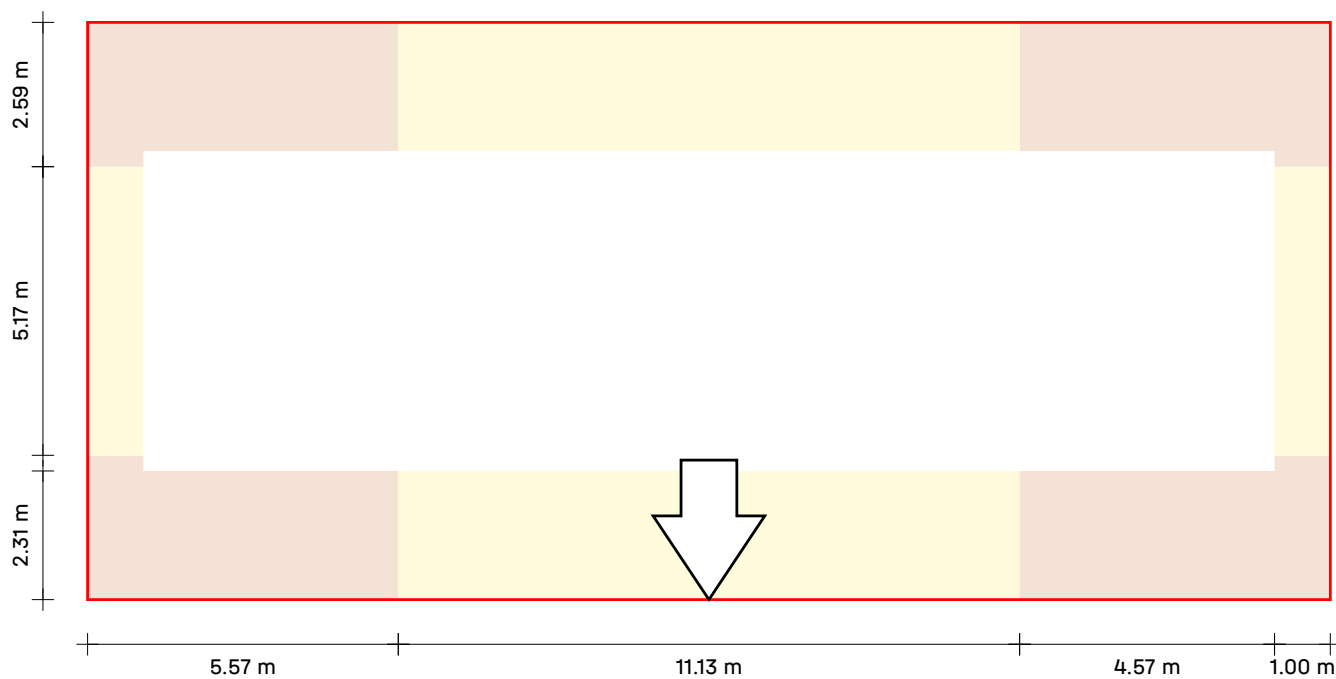
Pr	Profile	Fst D _{max}	maximum fastener spacing
Fst	Fastener	BR	Base Rail
σ	Stress	Usab.	serviceability limit state
f	Deflection	CL	Cantilever
F	Force		
CL/L _{max}	maximum cantilever length		



Roof 5 | Bill of material

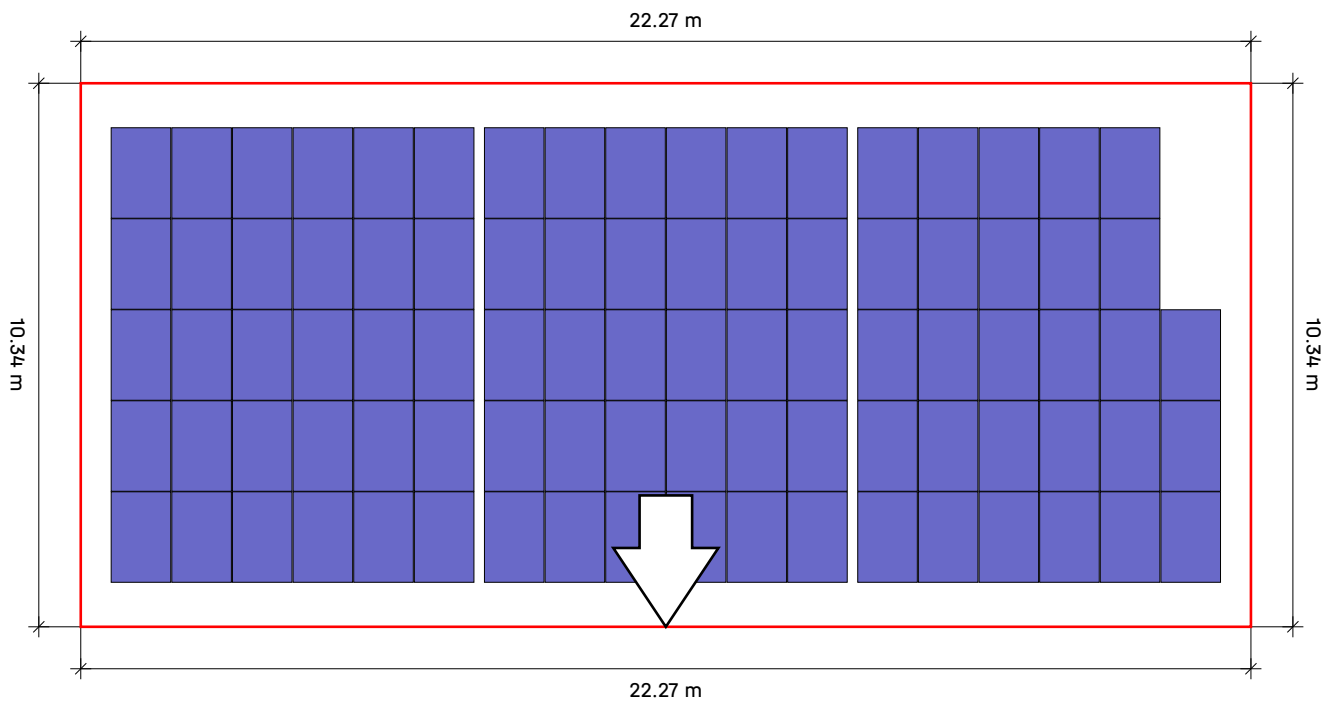
Position	Item no.	Item description	Quantity	Weight
1	1001164	K2 BasicClip	426	12.8 kg
2	1005193	Thread-forming metal screw 6.0×38	852	6.0 kg
3	2003072	OneMid Black Set 30-42	130	10.3 kg
4	2002589	OneEnd Black Set 30-42	60	5.2 kg
5	2004277	K2 BasicRail 22; 3.65 m	54	126.7 kg
6	1003571	K2 BasicRail BasicConnector Set	26	1.3 kg
7	1003558	K2 BasicRail BasicLock 22 Set	30	1.5 kg
Total				163.7 kg

Roof 6





Roof 6



Roof	System	Module	Height	Quantity	Total power
<u>Roof 6</u>	<u>K2 BasicRail</u>	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	20.00 m	88	37.84 kWp
 Trapezoidal					



Roof 6 | Assembly plan

Base Rails

Type	Whole Rails		Rail cutting		
	Total Rail Length	Quantity 3.65 m	Part of Rail / Rest	Length	Rest
26* A	7.024 m	1*3.65 m	3.650	3.374 from 3.650	0.266
4*B	5.870 m	1*3.65 m	3.650	2.220 from 3.650	1.420

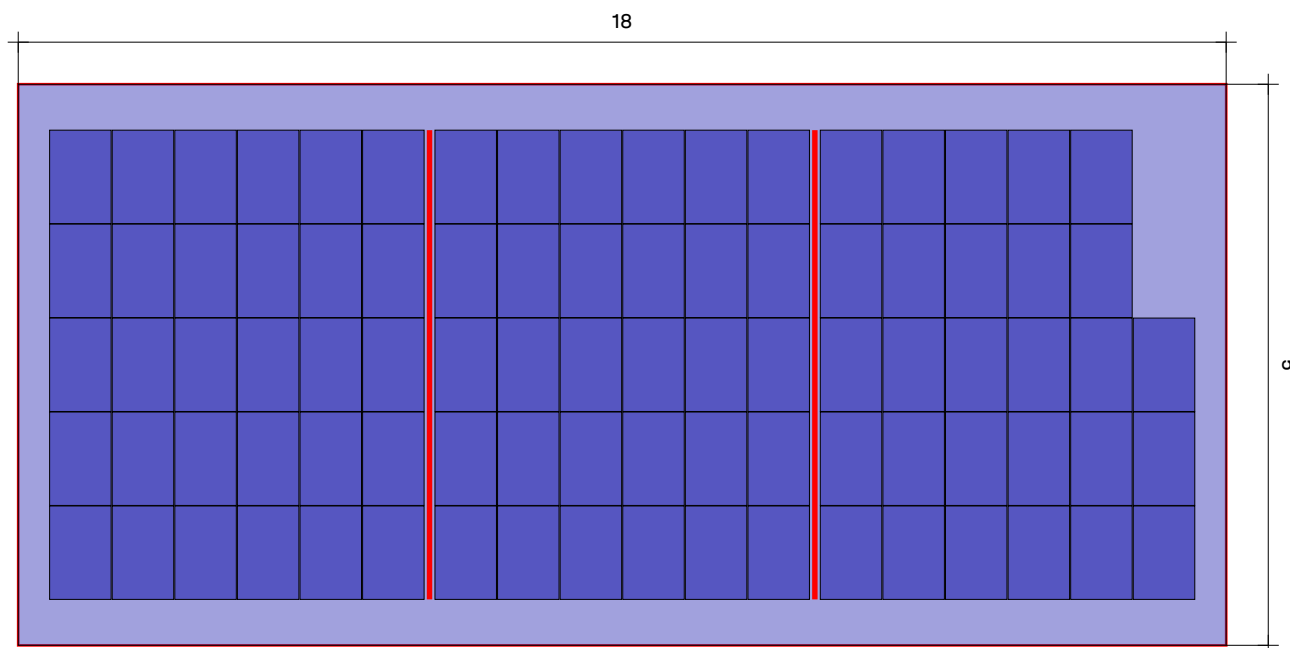
1 cm is viewed as lost for each cutting

Red numbers are leftover rails which will not be used any longer

Module arrays

Module array	Width[m]	Length[m]	Width in modules	Length in modules
1	21.11	8.65	18	5

Roof 6 | Module array 1



Roof ⑤ Module array ①

Mounting System

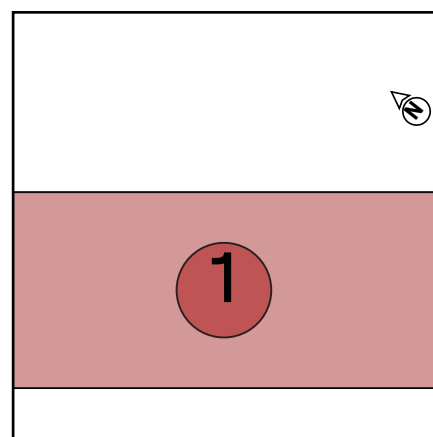
[K2 BasicRail](#)

Module

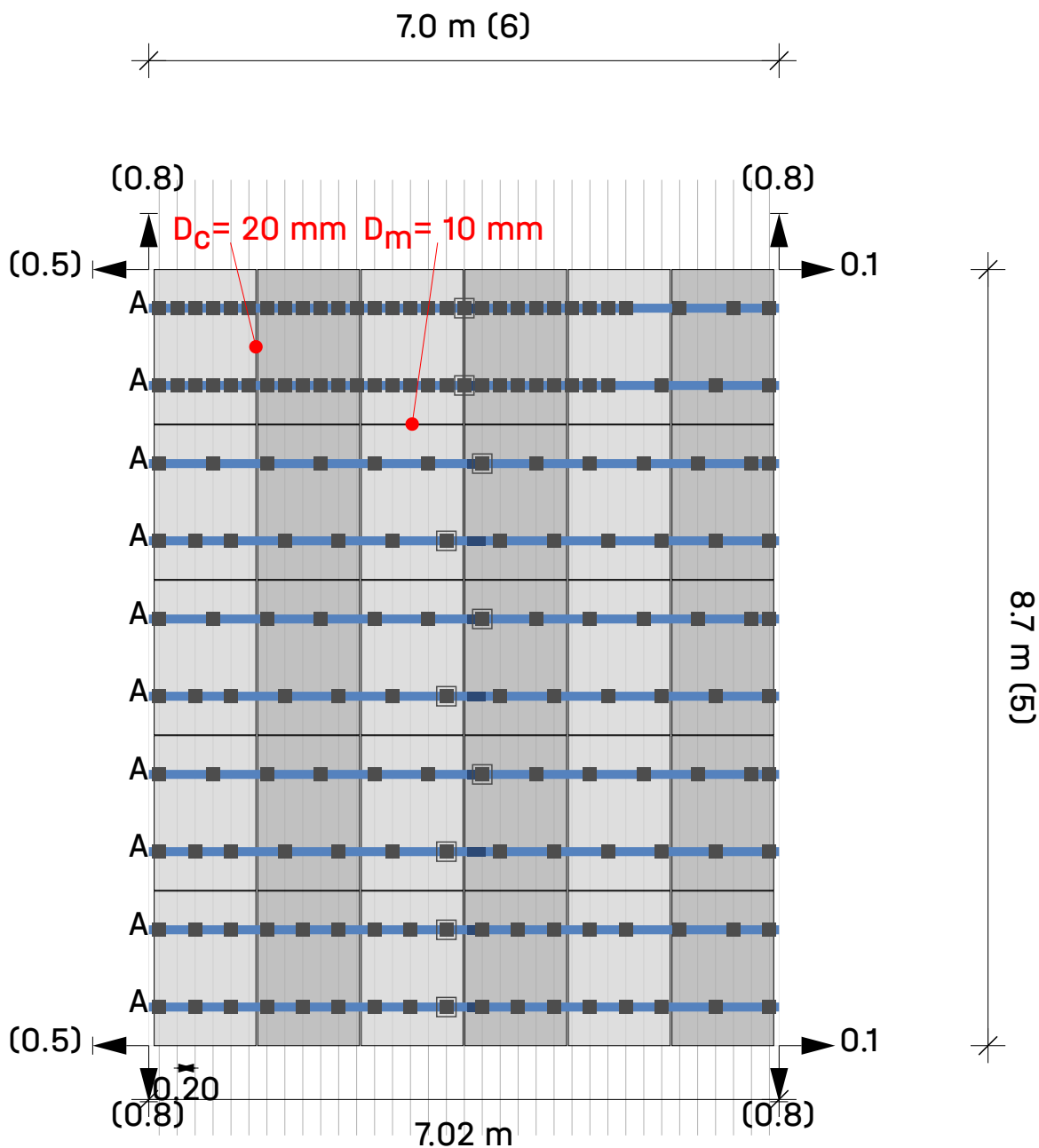
88(37.84 kWp) x DAS-DH108NA-430 (SchwarzThru)

Row spacing

1.73 m



Roof 6 | Module array 1 | Module blocks

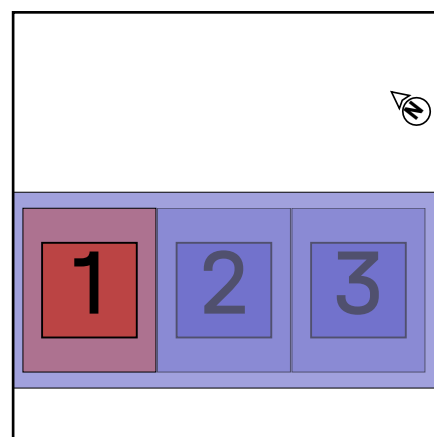


Roof ⑤ Module array ① Module block 1

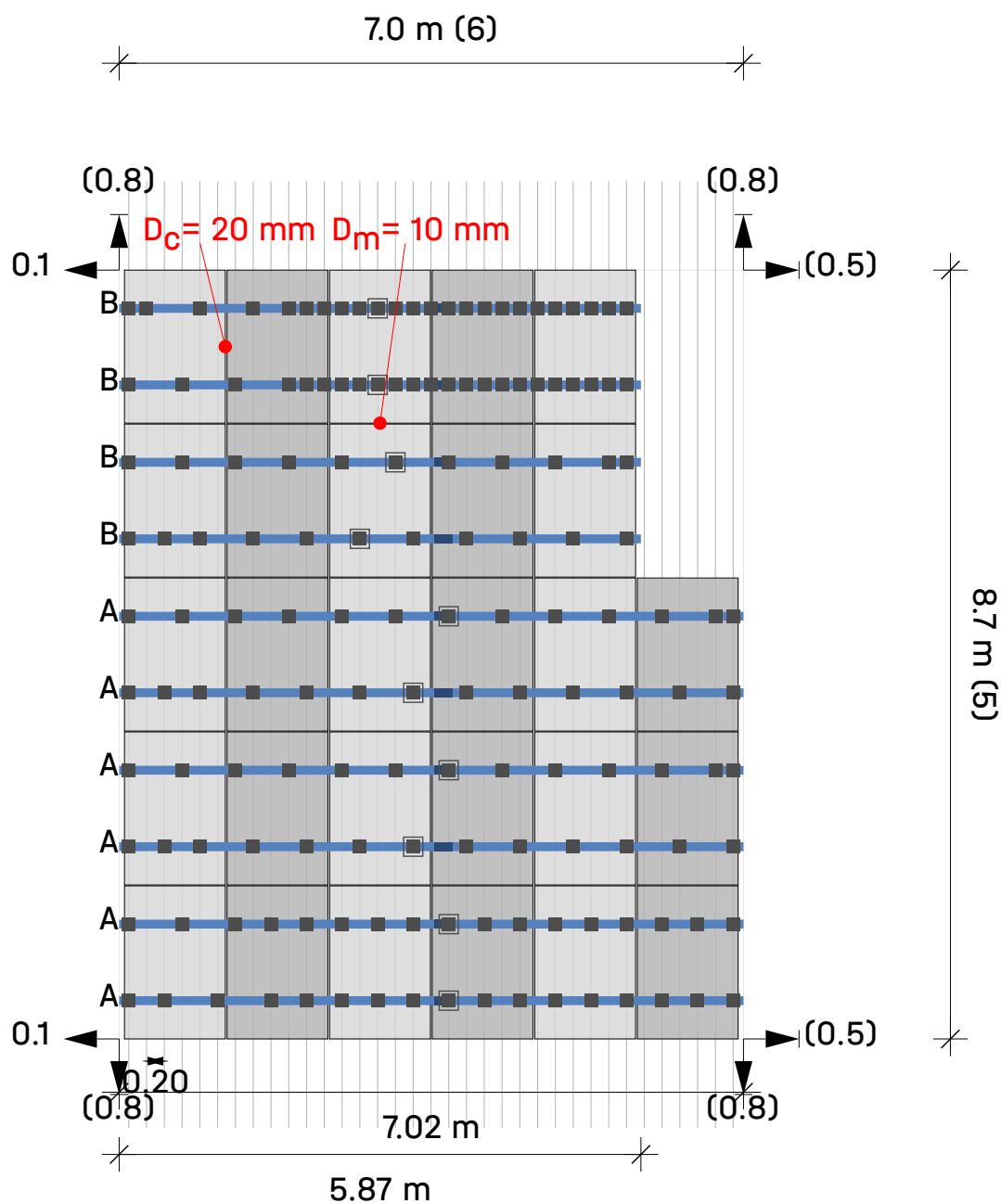
Modules $6 \times 5 = 30$

Legend

- Fastener
- BasicLocks
- Mounting rail: K2 BasicRail 22
- Dist. to neighbour module block/array [m]
- D_c Distance for clamping between modules
- D_m Distance between modules



Roof 6 | Module array 1 | Module blocks

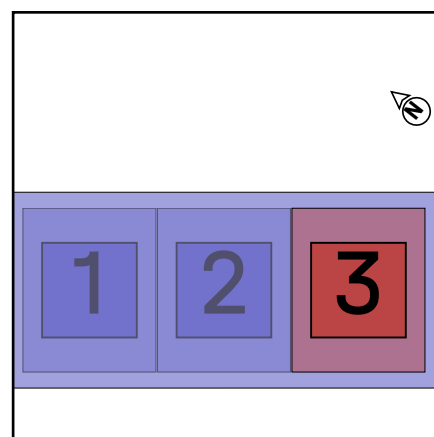


Roof ⑤ Module array ① Module block ③

Modules $(6 \times 5) - 2 = 28$

Legend

- Fastener
- BasicLocks
- Mounting rail: K2 BasicRail 22
- ➔ Dist. to neighbour module block/array [m]
- D_c Distance for clamping between modules
- D_m Distance between modules





Results | Roof 6

Roof	System	Module	Height	Quantity	Total power
<u>Roof 6</u>  Trapezoidal	<u>K2 BasicRail</u>	DAS-DH108NA-430 (SchwarzThru) 1,722×1,134×30 mm 430 Wp	20.00 m	88	37.84 kWp

Module

Name	DAS-DH108NA-430 (SchwarzThru)
Manufacturer	DAS Solar (Quzhou) Co., Ltd.
Output power	430 Wp
Dimensions	1,722×1,134×30 mm
Weight	20.5 kg

Components

Fastener	K2 BasicClip
Base rails	K2 BasicRail 22
Metal screw	Thread-forming metal screw 6.0×38

Loads on modules (module dimensioning)

Array	A-TrA [m²]	ultimate state [Pa]				Serviceability [Pa]			
		Pressure ⊥	Pressure ∥	Uplift ⊥	Uplift ∥	Pressure ⊥	Pressure ∥	Uplift ⊥	Uplift ∥
field area	1.95	926.3	196.7	-1,332.3	29.2	572.3	122.1	-764.5	29.2
eaves	1.95	926.3	196.7	-1,332.3	29.2	572.3	122.1	-764.5	29.2
corner region (eave)	1.95	926.3	196.7	-2,453.5	29.2	572.3	122.1	-1,444.0	29.2
gableboard	1.95	926.3	196.7	-1,652.7	29.2	572.3	122.1	-958.6	29.2
corner region (ridge)	1.95	926.3	196.7	-4,055.1	29.2	572.3	122.1	-2,414.6	29.2
ridge	1.95	926.3	196.7	-1,492.5	29.2	572.3	122.1	-861.5	29.2



Results | Roof 6

Utilisation result

No. Module Array	roof areas	ultimate limit state			Usab.	Distances		maximum values	
		Pr σ [%]	CL σ [%]	Fst F[%]	Pr f[%]	Fst [m]	BR [m]	CL L_{max} [m]	Fst D _{max} [m]
1	field area	21.2	7.7	75.8	13.6	0.600	---	0.454	0.792
1	eaves	21.2	3.4	75.8	13.6	0.600	---	0.454	0.792
1	corner region (eave)	17.3	7.3	92.0	5.1	0.400	---	0.400	0.435
1	gableboard	26.3	4.9	93.6	17.1	0.600	---	0.427	0.641
1	corner region (ridge)	7.1	23.4	75.7	1.1	0.200	---	0.200	0.264
1	ridge	23.8	3.9	84.7	15.4	0.600	---	0.440	0.709

Pr	Profile	Fst D _{max}	maximum fastener spacing
Fst	Fastener	BR	Base Rail
σ	Stress	Usab.	serviceability limit state
f	Deflection	CL	Cantilever
F	Force		
CL/L _{max}	maximum cantilever length		



Results | Roof 6

Important Information

- The quantity for K2 BasicRail BasicClips is calculated in such a way, that - according to the Assembly Instructions - a BasicClip can be installed on the crest to the left and right of a Rail Connector Set.
- The structure was statically verified in accordance with Eurocode 9: Design of aluminium structures (DIN EN 1999-1-1:2021) and offers sufficient load-bearing capacity and stability for the loads specified in the chapter 'Maximum actions on the components'.
- Adjustment factor for wind load regarding service life period, f_W , is according to DIN EN 1991-1-4/ NA, NDP for 4.2 (2P) note 5, table 3
- Adjustment factor for snow load regarding service life period, f_S , is according to DIN EN 1991-1-3/ annex D, table 4
- The structural design complies with BS EN 1990 - Basis of Structural Design.
- Snow loads are determined in accordance with National Annex BS NA EN 1991-1-3 (2018) - UK National Annex to EC1 - Action on structures - general actions - snow loads.
- Wind loads are determined in accordance with National Annex BS NA EN 1991-1-4 - UK National Annex to EC1 - Action on structures, general actions - wind actions.
- 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'.
- The person responsible for the execution of the work must check the load assumptions made with the conditions on site. If deviations are found, the person who prepared the static calculation must be consulted immediately. , in particular § 2 ("technical and specialist requirements for the customer"), § 7 ("warranty provisions") and § 8 ("limitation of liability").



Structural analysis report | Roof 6

General information

Name	New project
Mounting System	K2 BasicRail
Author	james wynne

Location information

Address	Warrington Rd, Rainhill, Prescot L35 5DR, UK
Ground elevation	64.79 m

Roof information

Building height	20.00 m
Roof type	Monopitch roof
Roof pitch	15°
Roof covering	Trapezoidal
Min. roof edge distance	0.00 m
Crest distance	200.0 mm
Crest width	22.0 mm
Crest height	40.0 mm
Roof material	Steel
Sheet quality	S235
Sheet thickness	0.500 mm

Loads

Design method	BS EN
Failure consequence class (CC)	CC3
Design working life	25 years
Terrain category	Town Terrain
Distance to shoreline	18.00 km
Distance inside town terrain	1.00 km

Wind load

Velocity pressure, 50 years	$q_{p,50} = 1.054 \text{ kN/m}^2$
Adjustment factor for service life	$f_w = 0.921$
Velocity pressure, 25 years	$q_{p,25} = 0.971 \text{ kN/m}^2$

Structural analysis report | Roof 6

Roof areas

Array	load impact area [m ²]	maxCpe ₁₀	minCpe ₁₀	wind pressure [kN/m ²]	wind suction [kN/m ²]
field area	10.00	0.200	-0.900	0.194	-0.874
eaves	10.00	0.200	-0.900	0.194	-0.874
corner region (eave)	10.00	0.200	-1.600	0.194	-1.553
gableboard	10.00	0.200	-1.100	0.194	-1.068
corner region (ridge)	10.00	0.200	-2.600	0.194	-2.524
ridge	10.00	0.200	-1.000	0.194	-0.971

Snow load

Snow load zone	3
Snow guard	No
Snow load on ground level	$s_k = 0.500 \text{ kN/m}^2$
Shape Coefficient for Snow	$\mu_i = 0.800$
Factor for roof pitch	$d_i = 0.966$
Snow load on roof, 50 year	$s_{i,50} = 0.386 \text{ kN/m}^2$
Adjustment factor for service life	$f_s = 0.929$
Snow load on roof, 25 years	$s_{i,25} = 0.359 \text{ kN/m}^2$

Dead Load

Weight of module	$G_M = 20.5 \text{ kg}$
Weight of mounting system per module	$= 2.0 \text{ kg}$
Module area	$A_M = 1.95 \text{ m}^2$
Dead weight of module per m ²	$= 10.50 \text{ kg/m}^2$
Dead weight of mounting system per m ²	$= 1.02 \text{ kg/m}^2$
Total Dead Load (excl. ballast) per m ²	$= 0.11 \text{ kN/m}^2$

Structural analysis report | Roof 6

Load Combinations

Ultimate limit state

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 variable loads	$\gamma_Q = 1.50$
Combination coefficient with regards to wind	$\psi_{0,W} = 0.60$
Combination coefficient with regards to Snow	$\psi_{0,S} = 0.50$
Importance factor permanent	$\kappa_{Fl,G} = 1.10$
Importance factor variable	$\kappa_{Fl,Q} = 1.10$
Characteristic dead weight	G_k
Characteristic snow load on the roof	$S_{i,n}$
Characteristic wind load	W_k

Load case combination 01	$LCC\ 01_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * S_{i,n}$
Load case combination 02	$LCC\ 02_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,Pressure}$
Load case combination 03	$LCC\ 03_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * (W_{k,Pressure} + \psi_{0,S} * S_{i,n})$
Load case combination 04	$LCC\ 04_{uls} = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * (S_{i,n} + \psi_{0,W} * W_{k,Pressure})$
Load case combination 06	$LCC\ 06_{uls} = \gamma_{G,inf} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,Suction}$

Serviceability limit state

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 01	$LCC\ 01_{sls} = G_k + S_{i,n}$
Load case combination 02	$LCC\ 02_{sls} = G_k + W_{k,Pressure}$
Load case combination 03	$LCC\ 03_{sls} = G_k + W_{k,Pressure} + \psi_{0,S} * S_{i,n}$
Load case combination 04	$LCC\ 04_{sls} = G_k + S_{i,n} + \psi_{0,W} * W_{k,Pressure}$
Load case combination 06	$LCC\ 06_{sls} = G_k + W_{k,Suction}$

Structural analysis report | Roof 6

Maximum load on modules (Mounting system dimensioning)

Array	A-TrA [m ²]	ultimate state [kN/m ²]				Serviceability [kN/m ²]			
		Pressure ⊥	Pressure 	Uplift ⊥	Uplift	Pressure ⊥	Pressure 	Uplift ⊥	Uplift
field area	10.00	0.926	0.197	-1.332	0.029	0.572	0.122	-0.764	0.029
eaves	10.00	0.926	0.197	-1.332	0.029	0.572	0.122	-0.764	0.029
corner region (eave)	10.00	0.926	0.197	-2.453	0.029	0.572	0.122	-1.444	0.029
gableboard	10.00	0.926	0.197	-1.653	0.029	0.572	0.122	-0.959	0.029
corner region (ridge)	10.00	0.926	0.197	-4.055	0.029	0.572	0.122	-2.415	0.029
ridge	10.00	0.926	0.197	-1.492	0.029	0.572	0.122	-0.862	0.029

Max. load on fastener

Array	A-TrA [m ²]	ultimate state [kN]				Serviceability [kN]			
		Pressure ⊥	Pressure 	Uplift ⊥	Uplift	Pressure ⊥	Pressure 	Uplift ⊥	Uplift
field area	10.00	0.526	0.112	-0.757	0.017	0.325	0.069	-0.434	0.017
eaves	10.00	0.526	0.112	-0.757	0.017	0.325	0.069	-0.434	0.017
corner region (eave)	10.00	0.351	0.075	-0.929	0.011	0.217	0.046	-0.547	0.011
gableboard	10.00	0.526	0.112	-0.939	0.017	0.325	0.069	-0.545	0.017
corner region (ridge)	10.00	0.175	0.037	-0.768	0.006	0.108	0.023	-0.457	0.006
ridge	10.00	0.526	0.112	-0.848	0.017	0.325	0.069	-0.490	0.017

Resistance Values of Components

Base Rails

Base Rails	A [cm ²]	I _y [cm ⁴]	I _z [cm ⁴]	W _y [cm ³]	W _z [cm ³]
K2 BasicRail 22	2.380	1.52	7.74	1.08	2.46

Fastener

Fastener	R _{D,Uplift,Perpendicular} [kN]	R _{D,Pressure,Perpendicular} [kN]	R _{D,Pressure,Parallel} [kN]
K2 BasicClip	1.02	-	0.96
Thread-forming metal screw 6.0×38	0.65	-	0.62



Structural analysis report | Roof 6

Utilisation result

No.	Module Array	roof areas	ultimate limit state			Usab.	Distances		maximum values	
			Pr σ [%]	CL σ [%]	Fst F[%]	Pr f[%]	Fst [m]	BR [m]	CL L_{max} [m]	Fst D _{max} [m]
1		field area	21.2	7.7	75.8	13.6	0.600	---	0.454	0.792
1		eaves	21.2	3.4	75.8	13.6	0.600	---	0.454	0.792
1		corner region (eave)	17.3	7.3	92.0	5.1	0.400	---	0.400	0.435
1		gableboard	26.3	4.9	93.6	17.1	0.600	---	0.427	0.641
1		corner region (ridge)	7.1	23.4	75.7	1.1	0.200	---	0.200	0.264
1		ridge	23.8	3.9	84.7	15.4	0.600	---	0.440	0.709

Pr	Profile	Fst D _{max}	maximum fastener spacing
Fst	Fastener	BR	Base Rail
σ	Stress	Usab.	serviceability limit state
f	Deflection	CL	Cantilever
F	Force		
CL/L _{max}	maximum cantilever length		



Roof 6 | Bill of material

Position	Item no.	Item description	Quantity	Weight
1	1001164	K2 BasicClip	486	14.6 kg
2	1005193	Thread-forming metal screw 6.0×38	972	6.8 kg
3	2003072	OneMid Black Set 30-42	146	11.5 kg
4	2002589	OneEnd Black Set 30-42	60	5.2 kg
5	2004277	K2 BasicRail 22; 3.65 m	60	140.8 kg
6	1003571	K2 BasicRail BasicConnector Set	30	1.5 kg
7	1003558	K2 BasicRail BasicLock 22 Set	30	1.5 kg
Total				181.9 kg



Bill of material

Position	Item no.	Item description	Quantity	Weight
1	2004096	S-Dome 6.10 Base Set L	360	676.8 kg
2	2004125	Dome 6.10 Peak	360	108.0 kg
3	2004178	Dome 6 Connector 495mm Set	171	70.6 kg
4	2003249	S-Dome 6.10 Windbreaker short	314	565.2 kg
5	2002937	Thread-forming metal screw 6×25	720	5.0 kg
6	2002870	K2 Solar Cable Manager	314	0.9 kg
7	2002609	DomeClamp Black MC Set 30-50	536	31.1 kg
8	2002610	DomeClamp Black EC Set 30-50	184	12.1 kg
9	2003150	Dome Porter short	28	41.4 kg
10	1001643	MK2	56	1.0 kg
11	2001729	Socket Head Bolt serrated M8×20	56	0.7 kg
12	2002300	Dome SpeedPorter	1,036	78.7 kg
13	2004123	Dome 6 Connector 195 Set	83	17.9 kg
14	1001164	K2 BasicClip	912	27.4 kg
15	1005193	Thread-forming metal screw 6.0×38	1,824	12.8 kg
16	2003072	OneMid Black Set 30-42	276	21.8 kg
17	2002589	OneEnd Black Set 30-42	120	10.4 kg
18	2004277	K2 BasicRail 22; 3.65 m	114	267.6 kg
19	1003571	K2 BasicRail BasicConnector Set	56	2.7 kg
20	1003558	K2 BasicRail BasicLock 22 Set	60	3.0 kg
Total				1,955.1 kg



Thank you for choosing a K2 mounting system.

Systems from K2 Systems are quick and easy to install.

We hope these instructions have helped.

Please contact us with any questions or suggestions for improvement.

Our contact data:

k2-systems.com/en/contact

Our General Terms of Business apply. Please refer to k2-systems.com

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