K2 | Connecting Strength

K2 Base Report

Ricky Chadwick

Planned installation date	10/04/2023
Project address	Croft Cottage, Norwich Rd, Earl Stonham, Stowmarket IP14 5DN, UK
Customer	Ricky Chadwick
Author	Daniel Saunders
Issue date & version	07/03/2023	K2 Base Version 3.1.67.1

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.

Contents

Project overview

Project information

Name	Ricky Chadwick
Address	Croft Cottage, Norwich Rd, Earl Stonham, Stowmarket IP14 5DN, UK
Ground elevation	47.66 m
Planned installation date	10/04/2023
Customer	Ricky Chadwick
Author	Daniel Saunders

Load settings

Design method	BS EN
Failure consequence class (CC)	CC1
Design working life	25 years
Terrain category	Country Terrain
distance to shoreline	20.00 km
Snow load zone	2
Snow load on ground level	0.40 kN/m²

Roofs

Roof	System	Module	Power	Quantity	Total power
Roof 1	TiltUp Vento	JAM54S30-405/MR (1000V)	405 Wp	16	6.48 kWp
Total				16	6.48 kWp

✓ THE PROJECT IS VERIFIED.
The selected mounting system can be installed as planned
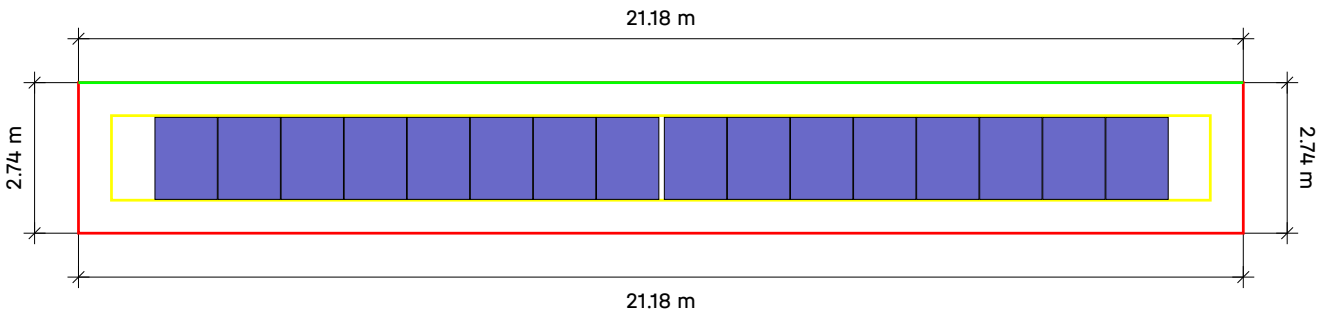Thank you for choosing a K2 mounting system.

Roofs

Project information

Name	**Ricky Chadwick**
Address	**Croft Cottage, Norwich Rd, Earl Stonham, Stowmarket IP14 5DN, UK**
Ground elevation	**47.66 m**
Planned installation date	**10/04/2023**
Customer	**Ricky Chadwick**
Author	**Daniel Saunders**

Roofs | Roof 1

21.18 m

2.74 m

2.74 m

21.18 m

Roof	System	Module	Power	Quantity	Total power
Roof 1	TiltUp Vento	JAM54S30-405/MR (1000V)	405 Wp	16	6.48 kWp

Roofs | Roof 1 | Pre-assembly / assembly instructions
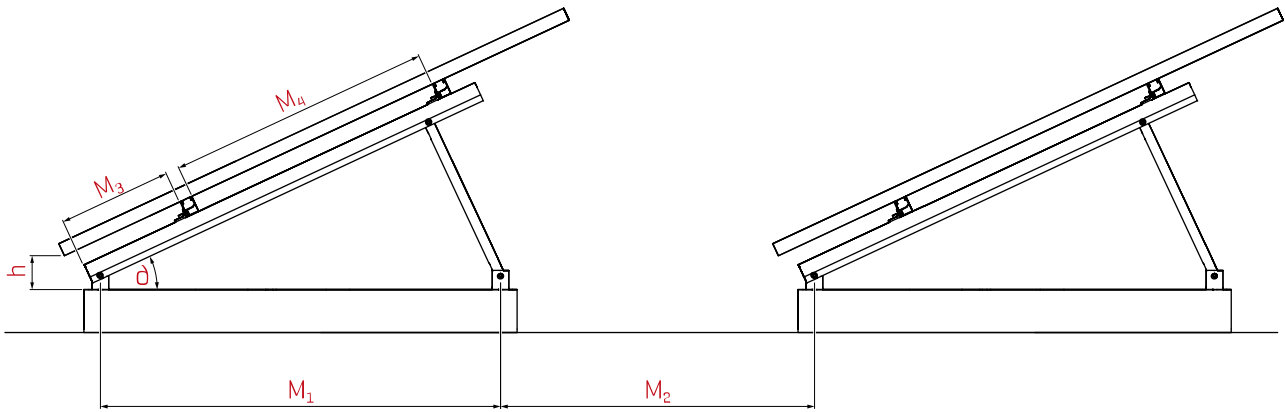
Module Array 1

δ	**30°**	M3	**268 mm**
M1	**1,262 mm**	M4	**822 mm**
M2	**3,528 mm**		

Roofs | Roof 1 | Assembly plan

Base Rails

Type	Whole Rails		Rail cutting		
	Total Rail Length	Quantity 4.40 m	Part of Rail	Length	Rest
A	9.243	2	4.400	1.000	3.390
B	9.243	2	3.390	1.000	2.380
C	9.243	2	2.380	1.000	1.370
D	9.243	2	1.370	1.000	0.360

Roofs | Roof 1 | Module array 1

16

1
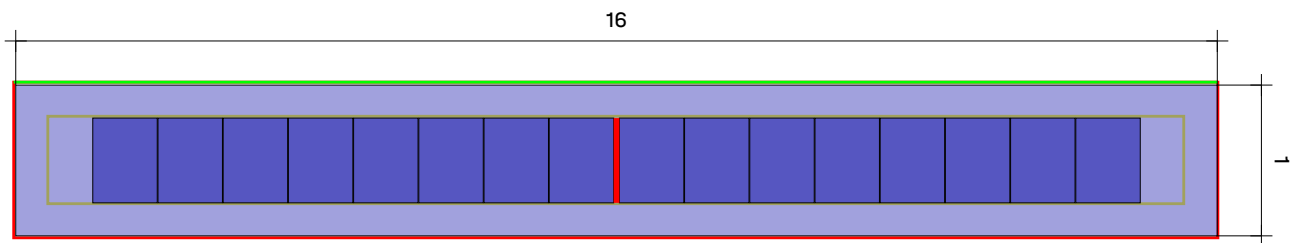
Roof ① Module array ❶

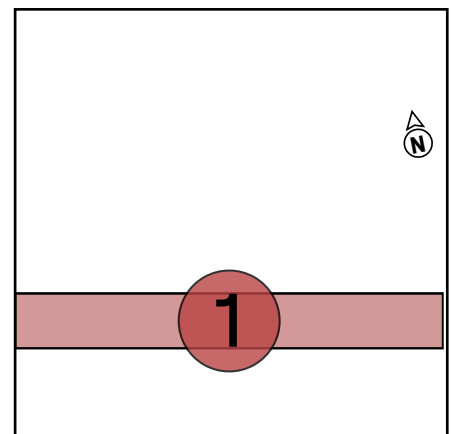| Mounting System	TiltUp Vento
Module	16(6.48 kWp) x JAM54S30-405/MR (1000V)
Row spacing	4.79 m
service corridor	3.30 m

1

Roofs | Roof 1 | Module array 1 | Module blocks

9.2 m (8)

(0.6)   (0.6)

s=1,523.8 mm, c=50.0 mm

(1.4)   (10.6)

B

| 345.4 | 345.4 | 345.4 | 345.4 | 345.4 | 345.4 | 345.4 |

A

1.5 m (1)

(1.4)   (10.6)

(0.6)   (0.6)
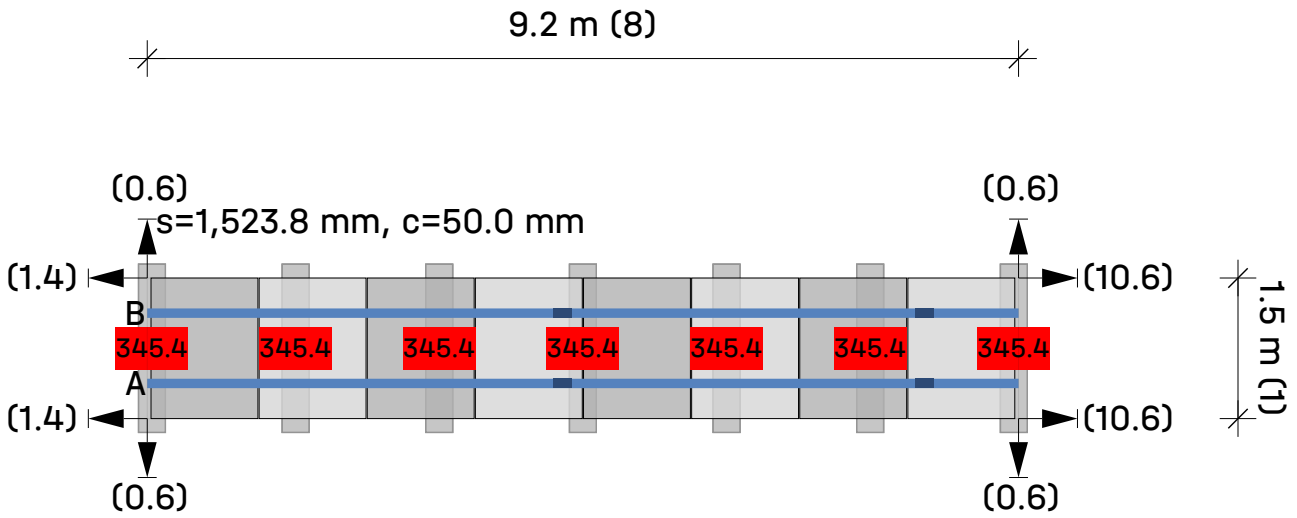
Roof ①   Module array ①   Module block 1

| Modules | 8 × 1 = **8** |

Legend

	Mounting rail: K2 SingleRail 36
	Row distance [m]
►|	Distance to Roof Edge [m]
25	Ballast in kilogram (kg)
	Porter Ballast
s	Span width
c	Cantilever

Roofs | Roof 1 | Module array 1 | Module blocks

9.2 m (8)

(0.6)   (0.6)

s=1,523.8 mm, c=50.0 mm

(10.6)   (1.3)

D

345.4 345.4 345.4 345.4 345.4 345.4 392.0

C

(10.6)   (1.3)

1.5 m (1)

(0.6)   (0.6)
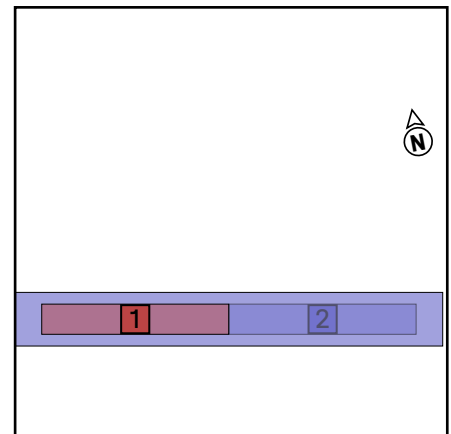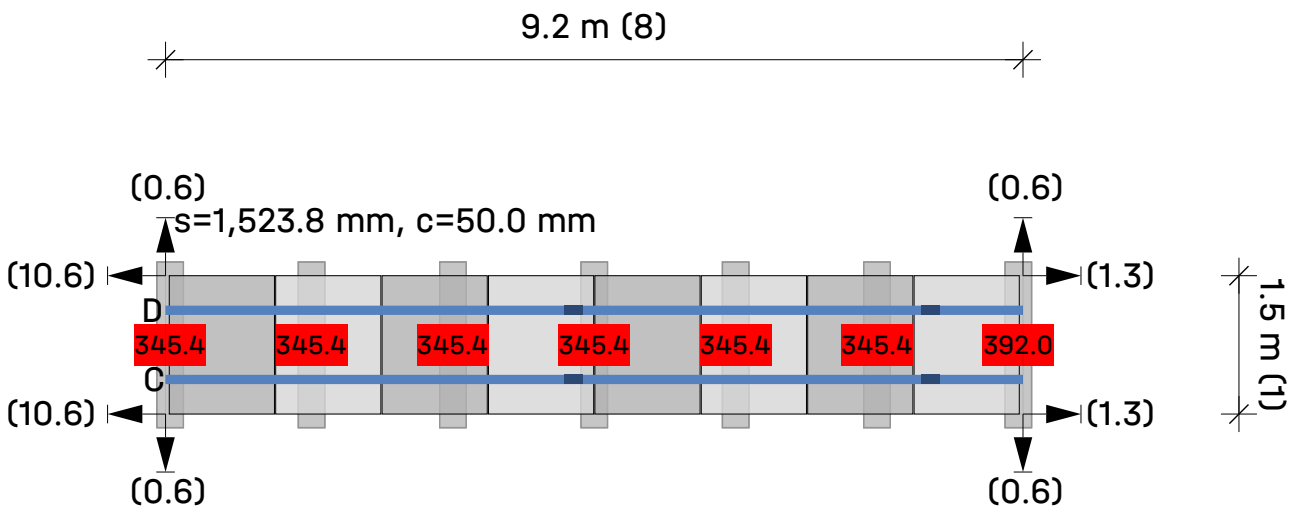
Roof ①   Module array ①   Module block **2**

Modules	8 × 1 = **8**

Legend

——	Mounting rail: K2 SingleRail 36
⌐‾	Row distance [m]
►|	Distance to Roof Edge [m]
25	Ballast in kilogram (kg)
▬	Porter Ballast
s	Span width
c	Cantilever
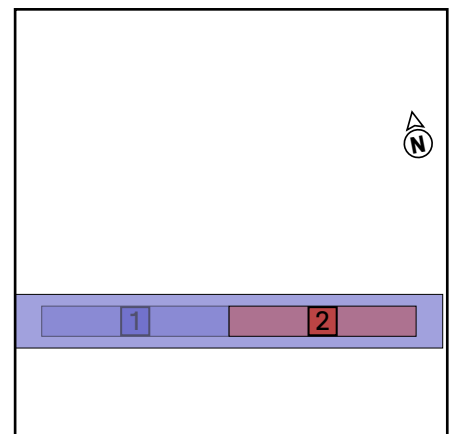
Results | Roof 1

Roof	System	Module	Power	Quantity	Total power
Roof 1	TiltUp Vento	JAM54S30-405/MR (1000V)	405 Wp	16	6.48 kWp

Module

Name	JAM54S30-405/MR (1000V)
Manufacturer	Shanghai JA Solar Technology Co. Ltd.
Output power	405 Wp
Dimensions	1,722×1,134×30 mm
Weight	21.5 kg

Notes

- The reinforcement of the concrete bar is to be installed according to static requirements.
- Information on concrete quality and reinforcement according to the manufacturer's information must be regarded at the load application points.
- Minimum concrete quality must be regarded, minimum C20/25 or equivalent.
- If necessary, a constructive crack reinforcement is to be installed.
- The structural design complies with BS EN 1990 - Basics 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'.
- 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").

Structural analysis report | Roof 1

General information

Name	**Ricky Chadwick**
Mounting System	**TiltUp Vento**
Author	**Daniel Saunders**

Location information

Address	**Croft Cottage, Norwich Rd, Earl Stonham, Stowmarket IP14 5DN, UK**
Ground elevation	**47.66 m**

Roof information

Building height	**0.10 m**
Roof type	**Flat roof**
Fastening method	**with Ballast**
Roof covering	**Flat**
Min. roof edge distance	**0.60 m**
Parapet wall height	**0.10 m**
Material	**Concrete**
Friction coefficient	**0.6**

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)	**CC1**
Design working life	**25 years**
Terrain category	**Country Terrain**
distance to shoreline	**20.00 km**

Wind load

Velocity pressure	$q_{p,50}$	= 0.501 kN/m²
Adjustment factor for service life	f_w	= 0.921
Velocity pressure	$q_{p,25}$	= 0.461 kN/m²

Structural analysis report | Roof 1

Snow load

Snow guard	**No**	
Snow load on ground level	s_k	= 0.400 kN/m²
Shape Coefficient for Snow	μ_i	= 0.800
Factor for roof pitch	d_i	= 1.000
Snow load on roof	$s_{i,50}$	= 0.320 kN/m²
Adjustment factor for service life	f_s	= 0.929
Snow load on roof	$s_{i,25}$	= 0.297 kN/m²

Dead Load

Weight module	G_M	= 21.5 kg
Weight mounting system per module area		= 6.0 kg
Module area	A_M	= 1.95 m²
Dead weight module		= 11.01 kg/m²
Dead weight mounting system		= 3.07 kg/m²
Total Dead Weight (excl. ballast)		= 0.14 kN/m²

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	$\gamma_{G,stb}$	= 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 permanent	$\kappa_{Fl,G}$	= 0.90
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 01	$E_d = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * S_{i,n}$
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	$E_d = \gamma_{G,sup} * \kappa_{Fl,G} * G_k + \gamma_Q * \kappa_{Fl,Q} * (S_{i,n} + \psi_{0,W} * W_{k,Pressure})$

Structural analysis report | Roof 1

Load case combination 06 $E_d = \gamma_{G,inf} * G_k + \gamma_Q * \kappa_{Fl,Q} * W_{k,Uplift}$

Position safety

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

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 $E_d = G_k + S_{i,n}$
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 $E_d = G_k + W_{k,Uplift}$

Bill of material

Position	Item no.	Item description	Quantity	Weight
1	2003222	SingleRail 36; 4.40 m	9	30.5 kg
2	2001976	SingleRail 36 RailConnector Set	8	3.0 kg
3	2003293	Multi-Monti concrete screw 7.5×60	28	0.5 kg
4	2003271	TiltUp Vento Foot	28	1.5 kg
5	2003267	TiltUp Vento Brace (679mm)	14	5.7 kg
6	2004066	TiltUp Vento Pin	42	1.3 kg
7	2001196	Spring Plug	42	0.4 kg
8	2003263	TiltUp Vento Beam (1300mm)	14	20.6 kg
9	2003145	SingleRail Climber Set 36/50	28	1.9 kg
10	1005157	MiddleClamp XS Black Set 30-33	28	2.0 kg
11	1005347	EndClamp Black Set 30-31	8	0.6 kg
12	1004767	SingleRail 36 End Cap	4	0.0 kg
Total				**68.1 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

Service Hotline: +44 1189 701280

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

K2 Solar Mounting Solutions Ltd

Unit 46 Easter Park
Benyon Road
Aldermaston, RG7 2PQ
Great Britain

+44 1189 701280

info@k2-systems.uk.com

k2-systems.com/en