



ST GABRIELS HALL,

TECHNICAL SUBMITTAL

6152_1586-PRO-ZZ-XX-TEC-M-6900

PV SYSTEM)

REVISION: P01

April 2024

ProMEP Ltd
Queensberry House
106 Queens Road
Brighton
East Sussex
BN1 3XF



To:	Project Team	From:	Ben Tasker
Company:	McLaren Construction Group PLC	Company:	ProMEP Ltd
Project Name:	St Gabriels Hall, 1 Oxford Place, Manchester		
Technical Submittal Reference:	6152_1586-PRO-ZZ-XX-TEC-M-6900	Revision:	P01
Technical Submittal Title:	PV System		
Approval Required:	10/05/2024	Approval Received:	

General Description:			
Proposed PV System for buildings 3 and 4. Please note, this does not currently form part of the contracted works and will be subject to agreement of a Variation Order.			
Specification:			
The following is the relevant project specification clauses that our proposals must comply with; 22032-CHD-ZZ-XX-SP-N-0001 - P01 - MEP specification with VE where applicable – ProMEP are on a D&B contract therefore some changes from the specification are to be expected.			
Drawings:			
The following is the relevant project drawings that our proposals must comply with; NA - See ProMEP E6900 range drawings			
Schedules:			
The following confirms the performance requirements of the specification compared with the performance of the proposed equipment for this project.			
Specification Criteria		Offered Performance	Complaint Y/N
Deviations:			
The following confirms the performance requirements of the specification compared with the performance of the proposed equipment for this project.			
Item	Date	Author	Reason
Manufacturers Information:			
Please see attached manufacturers literature.			
Installation Method:			
The following provides any specific and relevant installation information including clarity on any special manufacturer's information, attendances, access requirements or safety risks applicable for this project: See ProMEP RAMS			

Reviewed by:	Submittal Approval Status			Signed	Date:
	A	B	C		

Status (A: Approved, B: Continue with some comment, C: Rejected)

The background of the entire page is a photograph. In the foreground, there are rows of solar panels on a roof, angled towards the viewer. In the background, a city skyline with several tall, modern glass skyscrapers is visible against a sky with soft, orange and yellow clouds, suggesting a sunrise or sunset. A line of green trees separates the solar panels from the city buildings.

**PV TECHNICAL
SUBMITTAL
SOLAR PV
ST GABRIELS**

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Summary

Scope:

This submission describes the solar PV array, its component parts, design principles and estimated performance.

Project Description:

38kWp and 50kWp of photovoltaic panels mounted on a penetrative system are to be installed on the roofs of St Gabriels, New Student Accommodation.

Table of Key Information

System Size (kWp):	Building 3 - 38 kWp Building 4 - 50 kWp
Number of Solar Panels:	Building 3 - 86 Building 4 - 112
Number of Inverters:	Building 3 - 1 Building 4 - 1
Estimated Energy Yield (kWh) per annum:	Building 3 - 32,334 Building 4 - 42,300
CO2 Saving (kg):	Building 3 - 6,273 Building 4 - 8,206

Contact / Feedback:

All feedback / contact regarding this submittal is to be directed to:

mark@environmentalenergies.co.uk

Mob: 07504682576

RAMS / Method Statement:

Environmental Energies provides RAMS and method statements on a site specific basis. If selected we will provide within 5 working days of request, assuming site visit is granted and adequate.

System Performance:

The system is estimated to produce 32,334 kWh's and 42,300 kWh's of electrical energy on the A.C. output of the solar PV system.

System Losses:

The system has been designed to minimise losses both on the DC and AC aspects. Losses are reduced by sizing cables appropriately and choosing a suitable ratio of array size (DC) to inverter output (AC).

Shading:

The arrangement of panels on the roof has been designed to reduce shading from building elements as much as possible, such as parapet walls.

There will potentially be shading from objects on the roof however these have not been accounted for until an accurate report can be produced after a site survey is carried out with all roof furniture in place.

Disclaimer:

The performance of solar PV systems is impossible to predict with certainty due to the variability in the amount of solar radiation (sunlight) from location to location and from year to year. This estimate is based upon the standard MCS (Microgeneration Certification Scheme) procedure and is given as guidance only. It should not be considered as a guarantee of performance.

Grid Application Disclaimer:

At the time of writing, a DNO Offer has been submitted, and an offer received for the upgrade works necessary to carry out the installation.

Any associated DNO grid upgrades / infrastructure works / Export limitation or additional relays that may be required will be the responsibility of the client and not Environmental Energies. These costs cannot be estimated until a grid application has been placed and a response from the DNO received.



Electricity Network Connection (G99):

This solar PV system will be connected to the electricity distribution system and therefore must comply with the requirements of Engineering Recommendation G99 from the Energy Networks Association as it exceeds the 16A per phase limit of the related standard G99. As such all inverters are G99 type approved.

The network connection of this system is subject to formal approval under G99 from the current Distribution Network Operator (DNO) for the region.

Safeguarding of the distribution network and generating equipment against loss of mains (LOM) and other supply characteristic changes will be provided by a G99 mains protection relay or by the in-built grid connection parameters on the inverters depending on the DNO requirements which are defined in the response to the G99 application which would need to be submitted prior to installation.

Export Power Limits:

The DNO may impose a limit on the amount of power that can be exported onto the electricity supply network. In severely constrained network areas the DNO may impose a zero export limit meaning that no power at any time can be exported. In other cases they may allow up to a specified limit (kW).

Export of power can occur if the generated power from the solar PV system or other onsite generation exceeds the level of instantaneous power being consumed on the site. The excess of power will then flow out onto the electricity supply network and be consumed by other users. Constraints on the electricity supply network exist because parallel connected generation such as solar PV or wind can cause disruption and when this disruption exceeds the local tolerances the DNO will impose an export limit.

Once the G99 application for your solar PV array is submitted to the DNO and they send their response any export power limit will be identified.

Environmental Energies have significant experience in a number of possibilities for controlling Export Power limits, this would mean that the system may still be installed at its original size.

Installing an Export Power Control system is an ideal solution for sites where an export power limit is imposed but the likelihood of exporting power is low or non-existent due to high levels of power consumption (energy demand)



Planning Permission:

From May 2015 all solar PV systems exceeding 50kW in capacity must notify the local planning authority prior to the installation. Part 14 of the Town and Country Planning Order 2015 states:

Class J (c) development is permitted subject to the condition that before beginning the development the developer must apply to the local planning authority for a determination as to whether the prior approval of the authority will be required as to the design or external appearance of the development, in particular the impact of glare on occupiers of neighbouring land, and the following sub-paragraphs apply in relation to that application.

The application must be accompanied by:

- A written description of the proposed development
- A plan indicating the site and showing the proposed development
- The developer's contact address
- The developer's email address if the developer is content to receive communications electronically; together with any fee required to be paid

Environmental Energies have not been asked to complete planning documentation and therefore assume it is the client's responsibility to obtain planning permission for the solar PV system.

Mounting System & Structural:

Relevant Standards

- Guide to the Installation of Photovoltaic Systems 2012 (Publisher: Microgeneration Certification Scheme)
- BRE Digest 495: Mechanical installation of roof-mounted photovoltaic systems.
- EN 10088-1:2005 Stainless steels. List of stainless steels
- EN ISO 14713:1999 Protection against corrosion of iron and steel structures – Zinc and aluminium coatings Guidelines
- MCS 012 Product Certification Scheme Requirements - Pitched Roof Installation Kits
- MCS 017 Product Certification Scheme Requirements - Bespoke Building Integrated Photovoltaic Products

General Description:

The Solar PV systems will be designed and installed in accordance with the 'Guide to the Installation of Photovoltaic Systems 2012' which requires all roof penetrations (e.g. for PV modules, cables or brackets) must be durably sealed using purpose-made products capable of accommodating the movement and temperatures to which they may be subjected.



The guide also requires external metalwork used for brackets or mounting frames to be constructed correctly for supporting the imposed static and wind loads and must be adequately ballasted or fixed into a suitable structural member and shall be adequately protected from corrosion for a typical life to first maintenance of at least 20 years.

It must be ensured that the roof structure is capable of withstanding the loads (static and wind loads) that will be imposed by the PV modules and their mounting arrangements. If there is any doubt, a structural engineer must be consulted. Guidance on the mechanical installation and wind loads are given in BRE Digests 495 and 489 or BS 6399.

Responsibilities:

For this installation the client is responsible for the structural loading calculations for the building.

Wind Loads:

The design and specification of the PV array mounting system will take into account the wind and snow loads to be expected. Wind loads vary considerably across the UK and are influenced by factors such as site altitude, building height and local topography. Even where an approved mounting system kit is utilised, site specific calculations will be required to ensure that the system proposed is sufficient to withstand the imposed loads. For each site the imposed wind and snow loads should be derived

using the procedures within Eurocode-1 (BS EN 1991-1) and BRE Digest 489 Wind loads on roof-based photovoltaic systems.

For this installation Environmental Energies are responsible for the wind load calculations.

Mounting Frame:

The PV array fixings (type and quantity) have been checked to ensure that they can withstand the imposed (dead) load and wind uplift loads as calculated in appendices.

Roof Construction:

The roof is assumed to be Metal Profile Trapezoidal.

DC System:

Relevant Standards

- BS 7671 – Wiring Regulations 18th Edition

(Publisher: IET)

- Microgeneration Installation Standard: MIS 3002

(Publisher: DECC)

- Guide to the Installation of Photovoltaic Systems 2012

(Publisher: Microgeneration Certification Scheme)

Cables

Cables are sized in accordance with BS 7671 also taking into account the safety factors described below. Cables will comprise both insulation and supplementary insulation, or reinforced insulation. All cables will be BASEC approved.

All DC cables will be UV stabilised and water resistant and therefore suitable for outdoor installation.

Warning labels stating that the cables are live during daylight will be fixed to all cable runs over 10 meters.

Cable Containment

Cable containment will be used to provide mechanical protection on the roof.

Cable Entry into Building

It is important to take care in bringing cables into the building to ensure that the penetration does not allow the ingress of water.

For some new build installations Environmental Energies may require the roofing contractor to provide a suitable entry point via 'hockey stick' type duct. In other circumstances alternative routes can be identified at pre- installation stage. For complex and multi-level roofs multiple entry points may be required.



Isolation

A DC disconnection switch will be available, this will either be integrated into each inverter or be a separate rotary type switch located next to the inverter.

DC Connections

Each panel is connected together using the factory fitted plug and socket connectors on the panels fly leads. String cables are connected to the panels using the same type of connectors crimped onto the cable ends. These connectors comply with the requirements of BS EN:50521, and only connectors of the same manufacturer are mated together.

String Fuses

The need for string fuses is established using the following formula to each MPPT input on the inverters: $IR = (N-1) \times ISC$ Where N is the number of strings.

When IR is greater than the PV panels maximum series fuse rating then string fuses must be used and will be rated at $I_n \geq 1.5 \times ISC$ (stc) and $I_n \leq 2.4 \times ISC$ (stc).

Safety Factors

The DC components are rated as a minimum, at:

- Voltage: VOC (stc) $\times$ 1.15
- Current: ISC (stc) $\times$ 1.25 Losses

Cables are sized so that the overall voltage drop at the arrays maximum power (Standard Test Conditions) between the array and inverter is less than 1% for all strings.

Surge Protection

All of the solar inverters which Environmental Energies use conform to IEC 62109 which requires as a minimum the following overvoltage protection:

DC: Class C (Type 2) Surge Protection (2.5kV)

Additional external levels of DC overvoltage protection can be specified.



AC System:

Relevant Standards

- BS 7671:2008 – Wiring Regulations 18th Edition

(Publisher: IET)

- Micro generation Installation Standard: MIS 3002

(Publisher: DECC)

- Guide to the Installation of Photovoltaic Systems 2012

(Publisher: Micro generation Certification Scheme)

Cables are sized in accordance with BS 7671 also taking into account the safety factors described below.

All AC cabling will be compliant with British Standards and BASEC Approved, alternatively, if equipment complying with a foreign national standard based on an IEC standard is to be used, we as designers shall verify that any differences between that standard and the corresponding British or Harmonized standard will not result in a lesser degree of safety than that afforded by compliance with the British or Harmonized Standard. Such use shall be noted and appended to the appropriate documentation (testing documentations).

Cable Containmentment

Cable containmentment will be used to provide mechanical protection where appropriate. This will consist of cable tray, trunking or conduit in rigid PVC or galvanised steel.

Losses

The AC cable will be sized to minimise voltage drop. A 1% drop or less is recommended however in larger installations this is not always practical.

Isolation:

The inverters are fitted with an isolation switch for hardware disconnection, this will either be integrated into each inverter or be a separate rotary type switch location next to the inverter.

Protection:

Overcurrent protection is provided by means of a circuit breaker or fuse on the Low Voltage (LV) AC connection to the inverter.



Surge Protection:

All of the solar inverters which Environmental Energies use utilise conform to IEC 62109 which requires as a minimum the following overvoltage protection:

AC: Type 3 Surge Protection (4kV) Additional external levels of DC overvoltage protection can be specified.

Displays:

Performance displays are not included but can be added later

Switchgear and Distribution Boards:

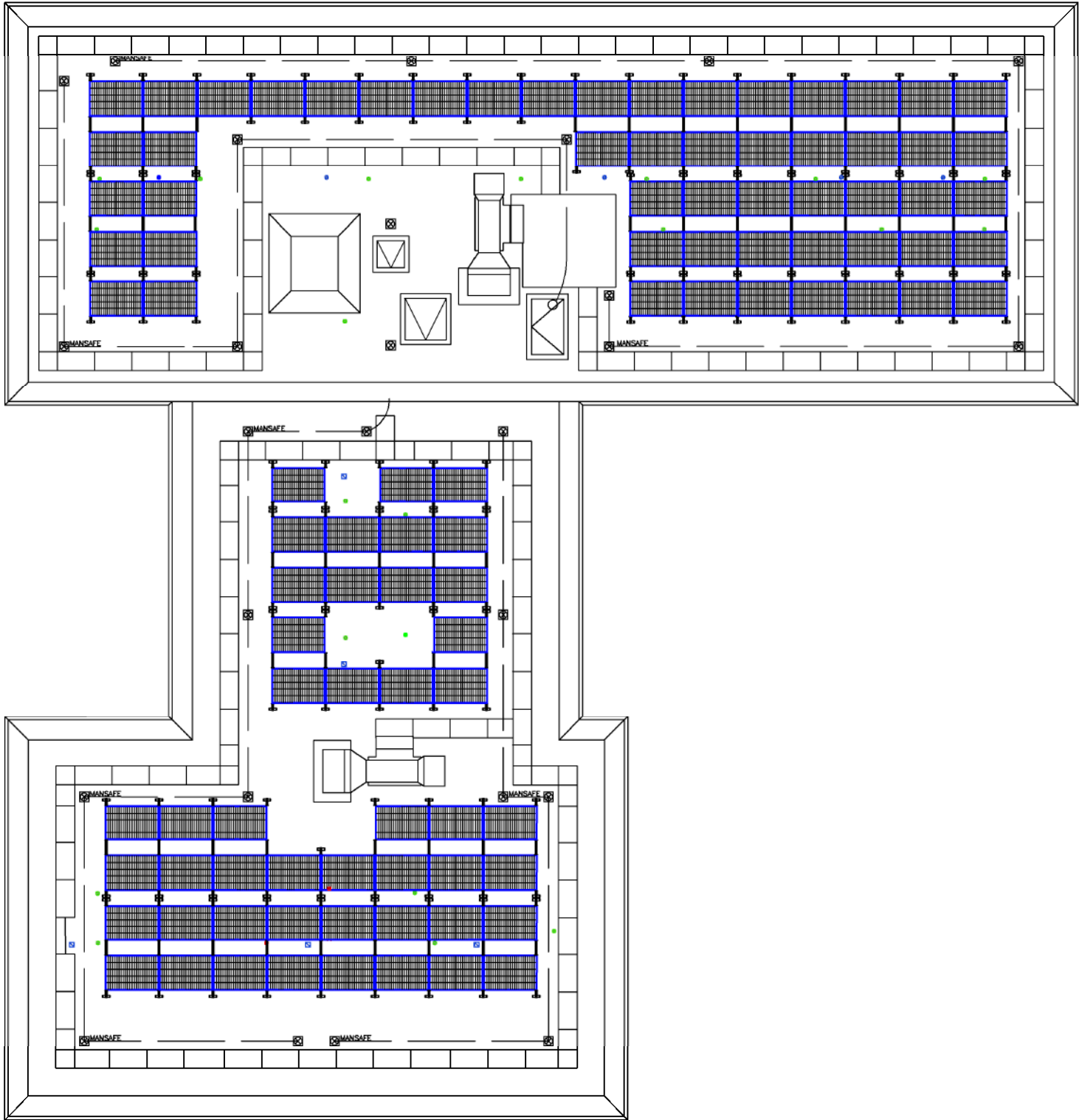
All switchgear and distribution boards will comply with BS EN:61439, BS EN:60947.

Monitoring:

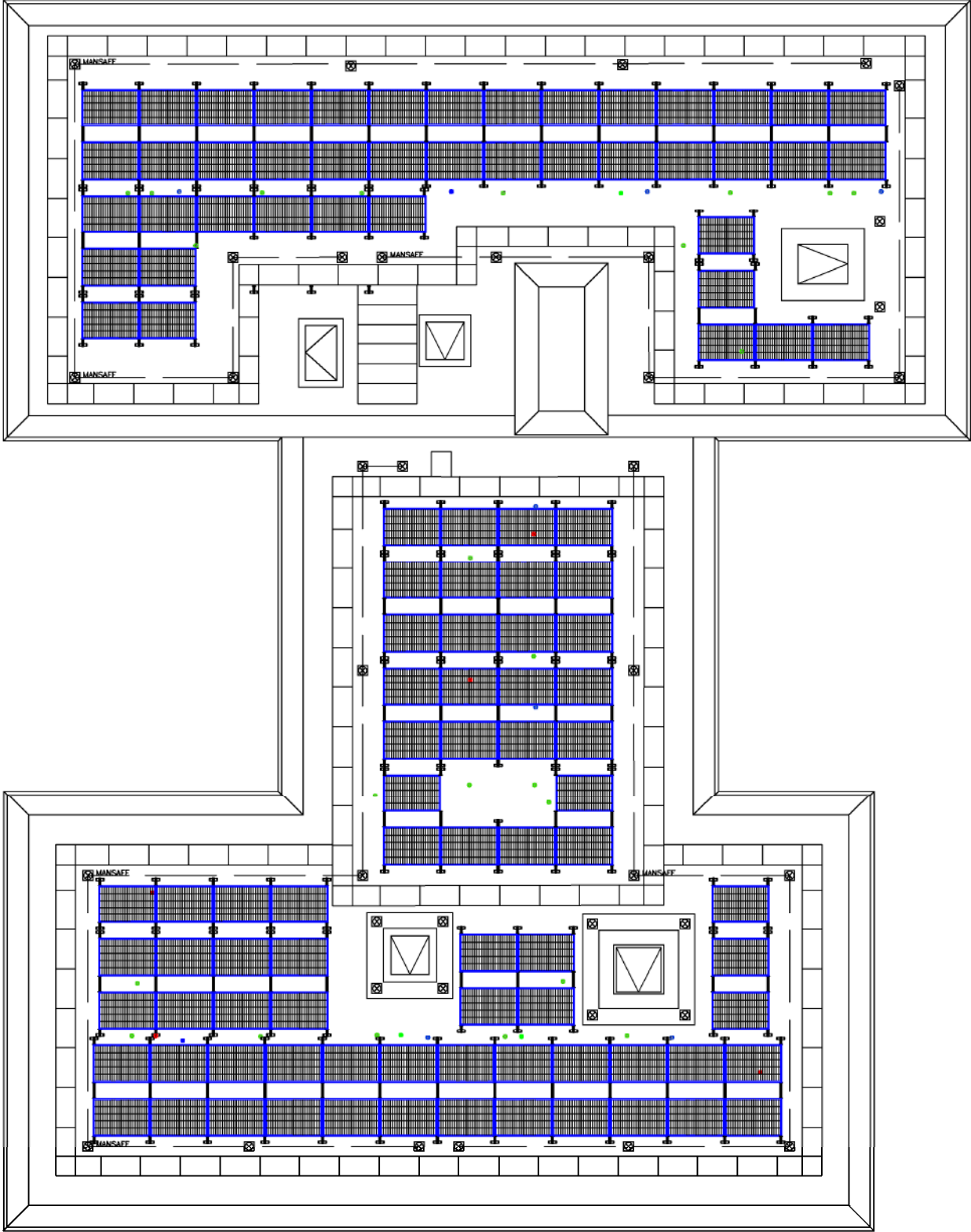
Solis Cloud monitoring is included via the Solis inverters supplied. An internet connection will be required at the inverters location, assumed in place at the time of installation by others.

Appendices:

1. **System Location / layout**
2. **Fixing Layout / Wind Calculations**
3. **Solar Panel Datasheet**
4. **Inverter Datasheets**
5. **Mounting Details**



A B C D	MANSAFE ADDED TO PLAN. UPDATED TO COMMENTS. PIPES ADDED MANSAFE UPDATED & VENTILATION ADDED	24/10/2023 14/11/2023 20/03/2024 28/03/2024	NOTES: SVP: ● RWP: ● CLASHING: ● *Subject to site survey and to be checked and verified by the Project Manager	DRAWING STATUS		CLIENT: St Gabriel's Manchester 1 Oxford Place	PROJECT: Building 03 (West)	TITLE: Solar PV Layout	
				ISSUED FOR INFORMATION	28/03/2024				
				ISSUED FOR APPROVAL					
				AS INSTALLED					
				N					
REV	DESCRIPTION	DATE					DATE: 28/03/2024	002	D
							DRAWN BY: JB		
							CHECKED BY: MB		



A B C D	MANSAFE ADDED TO PLAN. UPDATED TO COMMENTS. PIPES ADDED. MANSAFE UPDATED & VENTILATION ADDED	24/10/2023 14/11/2023	NOTES: SOLAR PV PANELS SVP: ● RWP: ● CLASHING ●	DRAWING STATUS		CLIENT: St Gabriel's Manchester 1 Oxford Place	PROJECT: Building 04 (East)	TITLE: SOLAR PV LAYOUT			
		ISSUED FOR INFORMATION		28/03/2024							
		ISSUED FOR APPROVAL									
		20/03/2024					Environmental Energies Limited Harborough Enterprise Centre Compass Point Business Park Northampton Road, Market Harborough LE16 9HW T: 01858 525407 E: sales@environmentalenergies.co.uk		SCALE: 1:180	DRAWING NUMBER 002	REV D
		28/03/2024					DATE: 28/03/2024				
							DRAWN BY: JB				
							CHECKED BY: MB				
REV	DESCRIPTION	DATE	*Subject to site survey and to be checked and verified by the Project Manager								

ValkPVplanner

Project report



Environmental Energies

United Kingdom of Great Britain
and Northern Ireland

Project name : St Gabriels, Manchester

Date (modified) : 09-04-2024

Time (modified) : 16:49

Company : Environmental Energies

User : Dayo Olatunya

Version ValkPVplanner : 2.16.73

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► Overview total project

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► Building 1 - Area 1 - Default Subarea 1

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► Location information

Project	: St Gabriels, Manchester
Project location	: 1 Oxford Pl, Manchester M14 5RP, UK
Terrain category	: Town
High neighbouring	: No
Wind area	: 23 m/s
Snow zone	: 0.5 kN/m ²
Altitude above sea	: 45 m
Distance to shore line	: 55 km
Distance to edge of the city	: 2 km
Peak wind pressure	: 897,87 N/m ²
Calculated load on panel due to wind and snow	: 828,69 Pa

► Project overview

Building	No. of PV-panels	Power [kWp]	System type	Weight of mounting system [kg]	No. of FULL tiles*	No. of HALF tiles**	Weight of ballast [kg]
Building 1	101	42,42		1.202	363	35	3.425
Building 1 - Area 1 - Default Subarea 1	101	42,42	ValkPro+	1.202	363	35	3.425
Total project	101	42,42		1.202	363	35	3.425

Tiles are included for all flat roof systems selected in this project.

Notes: The results in this project report can be based on default values. Please check if all values are correct.

Bill of Materials - Total project

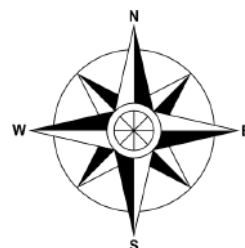
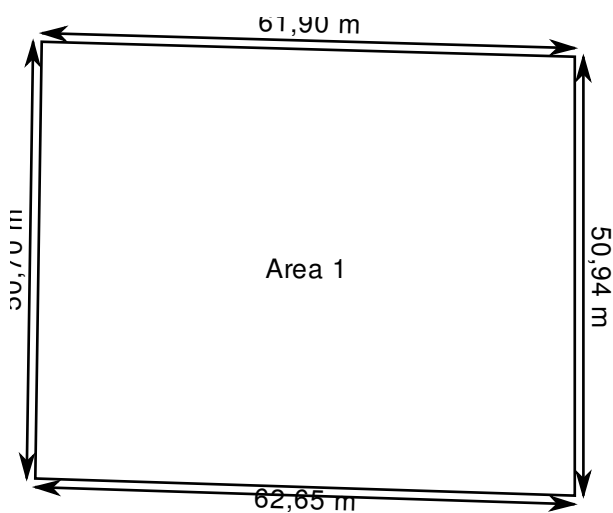
Article no.	Description	Package Qty.	Building 1	Total
729622	Rubber tile carrier - click - ValkPro+	30	203	203
741801500	Galv roof carrier L=1500x1,5mm	100	129	129
7506301545G	Tile 30 x 15 x 4,5cm - 4,5kg - UK	104	35	35
7506303045G	Tile 30 x 30 x 4,5cm - 9kg - UK	52	363	363
774221	Ss hammerhead bolt M8x20mm + lock nut	100	92	92
724650	Alu rear foot ValkPro+ L10° middle	25	73	73
724651	Alu rear foot ValkPro+ L10° side	25	56	56
724660	Alu front foot ValkPro+ P/L10° middle	25	73	73
724661	Alu front foot ValkPro+ P/L10° side	25	56	56
742512	Galv back plate ValkPro+ L10° L=1980mm	100	101	101
742564	Galv mass carrier ValkPro+ L=1979mm	100	148	148
773320	Ss thread-forming bolt M6x20mm - T30	100	255	255
742540	Galv side plate ValkPro+ L10° universal	100	42	42

The bill of materials shown on this page, refer to the materials needed for the total project.

The Bill of Materials per individual roof area can be found in the dedicated chapters of this user manual.

This drawing shows all the buildings of the total project including the different roof areas.

► Building 1



► Building information

Building name	: Building 1
Ridge height	: 16,00 m

► Roof information

Roof type	: Flat
Roof material	: Bitumen
Gravel present	: No
Roof friction coefficient	: 0.6



► System information

No. of panels south wall	: 101
Module	: SUNTECH STP420S-C54/Nshkm 1.722 x 1.134 x 0.030
Panel weight	: 21,00 Kg
Module orientation	: Landscape
Edge zone calculated	: 3,20 m
Edge zone adjusted	: 3,20 m
System choice	: ValkPro+
System colour	: Aluminium
Panel inclination	: 10
Azimuth	: 182
Foundation type	: Tile carrier
Include side plate	: Yes

► System type

ValkPro+



► Weight information

Weight of panels	:	2.121,00 kg
Weight of mounting system	:	1.201,86 kg
Weight of ballast	:	3.424,50 kg
Total weight	:	6.747,36 kg

► System dimensions

Subarea dimensions	:	2.481,16 m ²
System dimensions	:	262,55 m ²

► Roof loadings

Roof load based on subarea dimension	:	2,72 kg/m ² (26,68 N/m ²)
Roof load based on system dimension	:	25,70 kg/m ² (252,11 N/m ²)
Point load max. (max. ballasted points)	:	59 kPa (0,059 N/mm ²)
Point load min. (min. ballasted points)	:	22 kPa (0,022 N/mm ²)

► Option to reduce point load of max ballasted point

For projects where it is required to keep the point load to a minimum, there is the option to add load distributors for additional support of the ballasted points. The following reduction of point load can be achieved:

Point load reduction of the ValkPro+ system per ballast point		
Number of rubber load distributors per ballast point	Reduction of point load for ValkPro+ South	Reduction of point load for ValkPro+ East-West
0	0%	0%
1	71%	55%
2	73%	71%
3	88%	78%

The load distributors can be ordered using the following codes:

729630 for standard roofs

729631 for PVC roof membrane

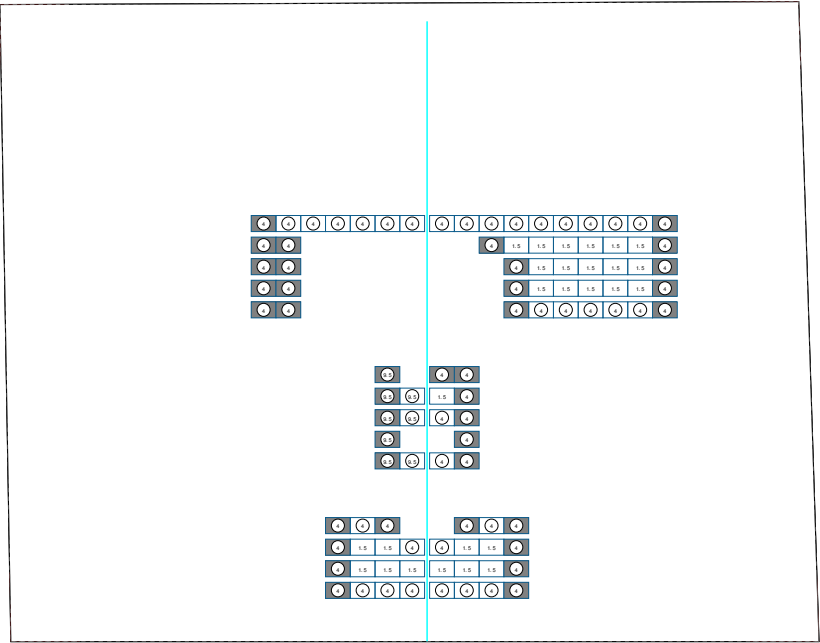
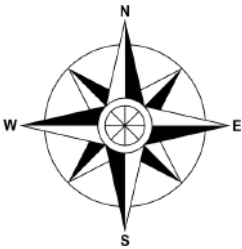
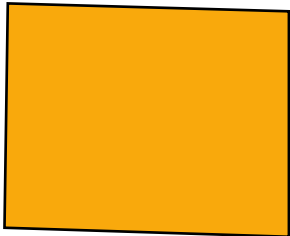
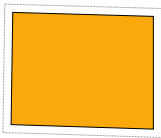
Bill of Materials |

Building 1 - Area 1 - Default Subarea 1

1.1.1

The bill of materials shown in this page apply to materials needed for Building 1 - Area 1 - Default Subarea 1

Article no.	Description	Package Qty.	Calc. Qty.	Extra Qty.	Total Qty.	Total weight
729622	Rubber tile carrier - click - ValkPro+	30	203	0	203	129,92
741801500	Galv roof carrier L=1500x1,5mm	100	129	0	129	331,53
7506301545G	Tile 30 x 15 x 4,5cm - 4,5kg - UK	104	35	0	35	157,50
7506303045G	Tile 30 x 30 x 4,5cm - 9kg - UK	52	363	0	363	3.267,00
774221	Ss hammerhead bolt M8x20mm + lock nut	100	92	0	92	2,39
724650	Alu rear foot ValkPro+ L10° middle	25	73	0	73	30,15
724651	Alu rear foot ValkPro+ L10° side	25	56	0	56	24,70
724660	Alu front foot ValkPro+ P/L10° middle	25	73	0	73	18,10
724661	Alu front foot ValkPro+ P/L10° side	25	56	0	56	15,40
742512	Galv back plate ValkPro+ L10° L=1980mm	100	101	0	101	241,49
742564	Galv mass carrier ValkPro+ L=1979mm	100	148	0	148	361,71
773320	Ss thread-forming bolt M6x20mm - T30	100	255	0	255	1,53
742540	Galv side plate ValkPro+ L10° universal	100	42	0	42	44,94
Total weight						4.626,36 kg



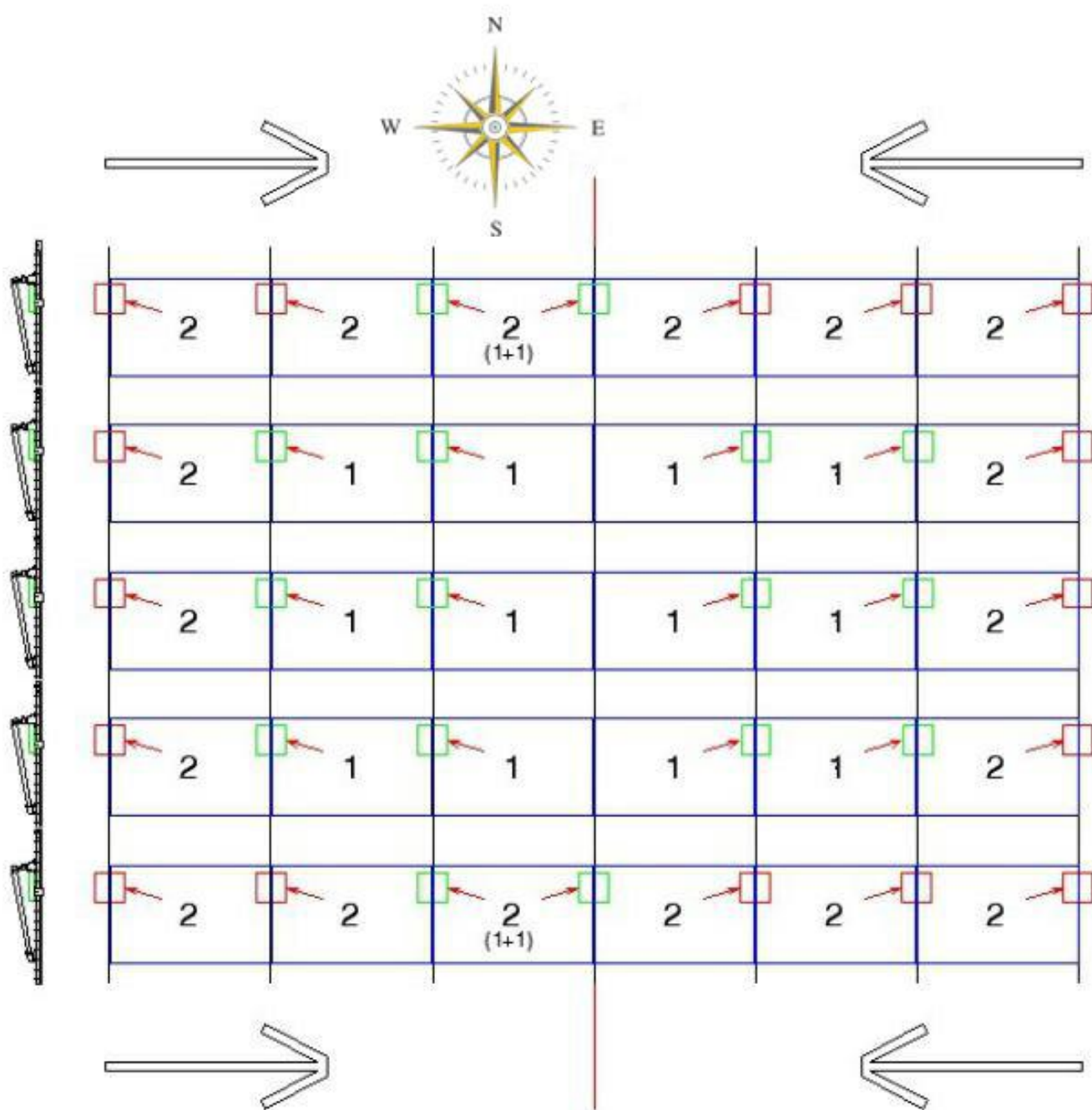
	Panels with mass carriers Number represents FULL tiles.	
	Panels with side plates and mass carriers Number represents FULL tiles.	
	Panels with side plates Number represents HALF tiles. Use HALF tiles only.	
1 Tile = 30 x 30 x 4,5 cm 9 kg 0,5 Tile = 30 x 15 x 4,5 4,5 kg		

Edge zone calculated: 3,20 m

Edge zone adjusted: 3,20 m

Dilatation line

Attention! When placing ballast: work from the outside edge of a row towards the centre. It is possible for one roof carrier in the middle of the row to have no ballast on it.



Placing ballast:

- Always work from the sides of the system inwards to the centre, when placing ballast
- In the centre row of the system (East to West), there is always on position without ballast (see red line)
- On this row, the ballast can be spread over the different positions (if possible)

All solar mounting systems of Van der Valk Solar Systems have been designed, calculated and manufactured according to Eurocodes and NEN 7250 regulations and its derivatives (listed below). These regulations have been used for the calculations in the Project Report. Van der Valk Solar Systems meets the applicable CE requirements regarding 2001/95/EG product safety and the applicable sections of BRL9931, components for solar systems. Van der Valk Solar Systems pitched roof clamp systems are MCS012 approved (MCS BBA 0159).

- **EN 1990 Base of Structural design**

National Annexes:

- BS EN 1990:2002+A1:2005
- DIN EN 1990/NA/A1
- IS-EN 1990:2002+A1:2005
- NBN EN 1990 ANB
- NEN-EN 1990+A1+A1/C2/NB
- NS-EN 1990:2002/NA:2008+A1:2010
- PN-EN 1990:2004/NA
- SFS-EN 1990/A1/AC
- SS-EN 1990/A1:2005/AC:2010

- **EN 1991-1-3 Actions on structures / Snow load**

National Annexes:

- BS-EN 1991-1-3:2003
- DIN EN 1991-1-3/NA
- IS-EN 1991-1-3:2003
- NBN EN 1991-1-3 ANB
- NEN-EN 1991-1-3:2003
- NS-EN 1991-1-3:2003/NA:2008
- PN-EN 1991-1-3:2005/NA
- SFS-EN 1991-1-3/AC
- SS-EN 1991-1-3/A1:2015

- **EN 1991-1-4 Actions on structures / Wind load**

National Annexes:

- BS EN 1991-1-4:2005+A1:2010
- DIN EN 1991-1-4/NA
- IS-EN 1991-1-4:2005/NA:2013
- NBN EN 1991-1-4 ANB
- NEN-EN 1991-1-4:2005
- NS-EN 1991-1-4:2005/NA:2009
- PN-EN 1991-1-4:2008/NA
- SFS-EN 1991-1-4+AC+A1
- SS-EN 1991-1-4:2005/AC:2010

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- **N 1993-1-3 Design of steel structures / Rules for cold formed members**

- **EN 1997 Geotechnical design**

- **EN 1998-1 Design of structures / Seismic actions**

- **EN 1999-1-1 Design of aluminium structures**

- **NEN 7250 Solar systems - Integration in roofs and facades**

- **2001/95/EG Product safety**

- **BRL9931 Components of solar systems**

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► Disclaimer

- Van der Valk Solar Systems B.V. does not accept any liability for any direct and/or indirect consequences of any act (or omission) ensuing from the information or the failure to observe the instructions provided in this project report and the installation manual, nor for possible incorrect use of the ValkPVplanner by the customer.
- The calculations do not take into account obstacles in the near surrounding like high buildings, cliffs and mountains.
- For the full disclaimer of the ValkPVplanner, please visit our website.: www.valksolarsystems.nl.

► Contact

- If you have any questions about the ValkPVplanner, calculation results or this project report: please contact the Van der Valk Solar Systems team.

ValkPVplanner

Project report



Environmental Energies

United Kingdom of Great Britain
and Northern Ireland

Project name : St Gabriels, Manchester 04

Date (modified) : 09-04-2024

Time (modified) : 16:56

Company : Environmental Energies

User : Dayo Olatunya

Version ValkPVplanner : 2.16.73

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► Overview total project

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•	Bill of Materials - Total project	04
•	Drawing total project	05

► Building 1 - Area 1 - Default Subarea 1

•	Information Building 1 - Area 1 - Default Subarea 1	06
•	Strength calculations Building 1 - Area 1 - Default Subarea 1	07
•	Bill of Materials Building 1 - Area 1 - Default Subarea 1	08
•	Drawing Building 1 - Area 1 - Default Subarea 1	09

► Regulations 11

► Safety instructions | Warranty 13

► Location information

Project	: St Gabriels, Manchester 04
Project location	: 1 Oxford Pl, Manchester M14 5RP, UK
Terrain category	: Town
High neighbouring	: No
Wind area	: 23 m/s
Snow zone	: 0.5 kN/m ²
Altitude above sea	: 45 m
Distance to shore line	: 55 km
Distance to edge of the city	: 2 km
Peak wind pressure	: 897,87 N/m ²
Calculated load on panel due to wind and snow	: 511,43 Pa

► Project overview

Building	No. of PV-panels	Power [kWp]	System type	Weight of mounting system [kg]	No. of FULL tiles*	No. of HALF tiles**	Weight of ballast [kg]
Building 1	112	47,04		1.395	382	22	3.537
Building 1 - Area 1 - Default Subarea 1	112	47,04	ValkPro+	1.395	382	22	3.537
Total project	112	47,04		1.395	382	22	3.537

Tiles are included for all flat roof systems selected in this project.

Notes: The results in this project report can be based on default values. Please check if all values are correct.

Bill of Materials - Total project

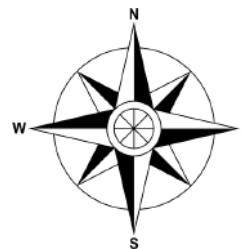
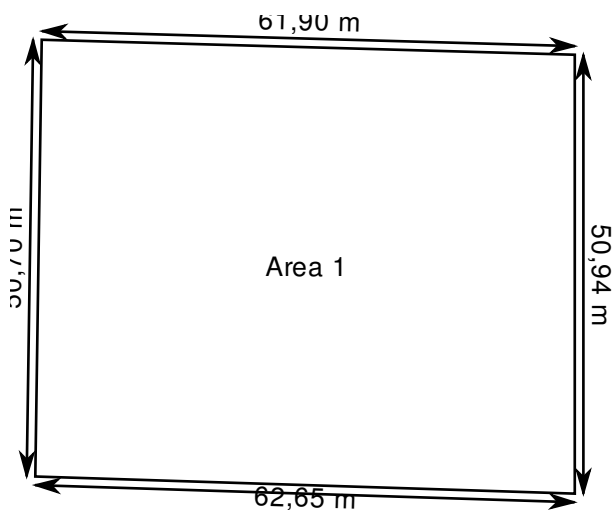
Article no.	Description	Package Qty.	Building 1	Total
729622	Rubber tile carrier - click - ValkPro+	30	226	226
741801500	Galv roof carrier L=1500x1,5mm	100	148	148
7506301545G	Tile 30 x 15 x 4,5cm - 4,5kg - UK	104	22	22
7506303045G	Tile 30 x 30 x 4,5cm - 9kg - UK	52	382	382
774221	Ss hammerhead bolt M8x20mm + lock nut	100	109	109
724650	Alu rear foot ValkPro+ L10° middle	25	76	76
724651	Alu rear foot ValkPro+ L10° side	25	72	72
724660	Alu front foot ValkPro+ P/L10° middle	25	76	76
724661	Alu front foot ValkPro+ P/L10° side	25	72	72
742512	Galv back plate ValkPro+ L10° L=1980mm	100	112	112
742564	Galv mass carrier ValkPro+ L=1979mm	100	180	180
773320	Ss thread-forming bolt M6x20mm - T30	100	304	304
742540	Galv side plate ValkPro+ L10° universal	100	52	52

The bill of materials shown on this page, refer to the materials needed for the total project.

The Bill of Materials per individual roof area can be found in the dedicated chapters of this user manual.

This drawing shows all the buildings of the total project including the different roof areas.

► Building 1

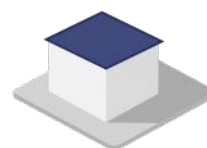


► Building information

Building name : Building 1
Ridge height : 16,00 m

► Roof information

Roof type : Flat
Roof material : Bitumen
Gravel present : No
Roof friction coefficient : 0.6



► System information

No. of panels south wall : 112
Module : SUNTECH STP420S-C54/Nshkm 1.722 x 1.134 x 0.030
Panel weight : 21,00 Kg
Module orientation : Landscape
Edge zone calculated : 3,20 m
Edge zone adjusted : 3,20 m
System choice : ValkPro+
System colour : Aluminium
Panel inclination : 10
Azimuth : 182
Foundation type : Tile carrier
Include side plate : Yes

► System type

ValkPro+



► Weight information

Weight of panels	:	2.352,00 kg
Weight of mounting system	:	1.394,80 kg
Weight of ballast	:	3.537,00 kg
Total weight	:	7.283,80 kg

► System dimensions

Subarea dimensions	:	2.481,16 m ²
System dimensions	:	291,14 m ²

► Roof loadings

Roof load based on subarea dimension	:	2,94 kg/m ² (28,80 N/m ²)
Roof load based on system dimension	:	25,02 kg/m ² (245,43 N/m ²)
Point load max. (max. ballasted points)	:	33 kPa (0,033 N/mm ²)
Point load min. (min. ballasted points)	:	22 kPa (0,022 N/mm ²)

► Option to reduce point load of max ballasted point

For projects where it is required to keep the point load to a minimum, there is the option to add load distributors for additional support of the ballasted points. The following reduction of point load can be achieved:

Point load reduction of the ValkPro+ system per ballast point		
Number of rubber load distributors per ballast point	Reduction of point load for ValkPro+ South	Reduction of point load for ValkPro+ East-West
0	0%	0%
1	71%	55%
2	73%	71%
3	88%	78%

The load distributors can be ordered using the following codes:

729630 for standard roofs

729631 for PVC roof membrane

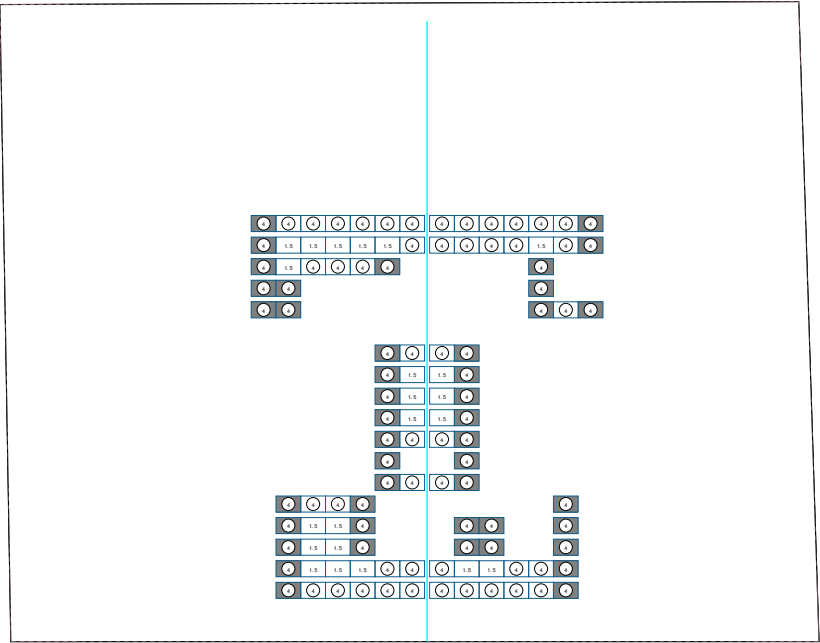
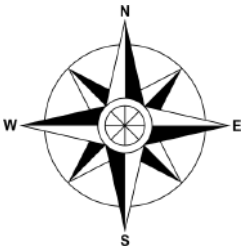
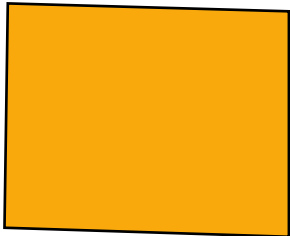
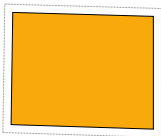
Bill of Materials |

Building 1 - Area 1 - Default Subarea 1

1.1.1

The bill of materials shown in this page apply to materials needed for Building 1 - Area 1 - Default Subarea 1

Article no.	Description	Package Qty.	Calc. Qty.	Extra Qty.	Total Qty.	Total weight
729622	Rubber tile carrier - click - ValkPro+	30	226	0	226	144,64
741801500	Galv roof carrier L=1500x1,5mm	100	148	0	148	380,36
7506301545G	Tile 30 x 15 x 4,5cm - 4,5kg - UK	104	22	0	22	99,00
7506303045G	Tile 30 x 30 x 4,5cm - 9kg - UK	52	382	0	382	3.438,00
774221	Ss hammerhead bolt M8x20mm + lock nut	100	109	0	109	2,83
724650	Alu rear foot ValkPro+ L10° middle	25	76	0	76	31,39
724651	Alu rear foot ValkPro+ L10° side	25	72	0	72	31,75
724660	Alu front foot ValkPro+ P/L10° middle	25	76	0	76	18,85
724661	Alu front foot ValkPro+ P/L10° side	25	72	0	72	19,80
742512	Galv back plate ValkPro+ L10° L=1980mm	100	112	0	112	267,79
742564	Galv mass carrier ValkPro+ L=1979mm	100	180	0	180	439,92
773320	Ss thread-forming bolt M6x20mm - T30	100	304	0	304	1,82
742540	Galv side plate ValkPro+ L10° universal	100	52	0	52	55,64
Total weight						4.931,80 kg



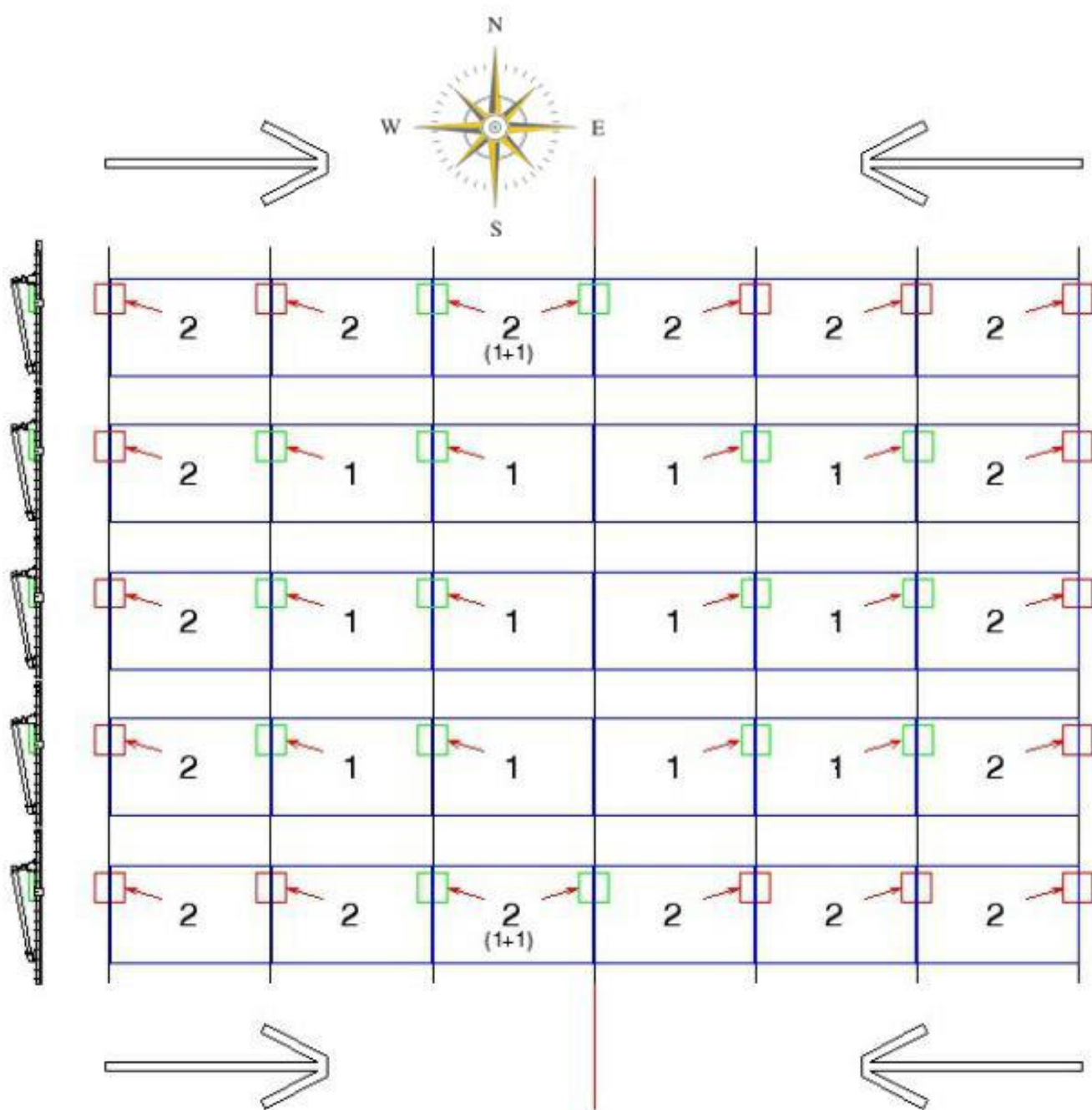
	Panels with mass carriers Number represents FULL tiles.	
	Panels with side plates and mass carriers Number represents FULL tiles.	
	Panels with side plates Number represents HALF tiles. Use HALF tiles only.	
1 Tile = 30 x 30 x 4,5 cm 9 kg 0,5 Tile = 30 x 15 x 4,5 4,5 kg		

Edge zone calculated: 3,20 m

Edge zone adjusted: 3,20 m

Dilatation line

Attention! When placing ballast: work from the outside edge of a row towards the centre. It is possible for one roof carrier in the middle of the row to have no ballast on it.



Placing ballast:

- Always work from the sides of the system inwards to the centre, when placing ballast
- In the centre row of the system (East to West), there is always on position without ballast (see red line)
- On this row, the ballast can be spread over the different positions (if possible)

All solar mounting systems of Van der Valk Solar Systems have been designed, calculated and manufactured according to Eurocodes and NEN 7250 regulations and its derivatives (listed below). These regulations have been used for the calculations in the Project Report. Van der Valk Solar Systems meets the applicable CE requirements regarding 2001/95/EG product safety and the applicable sections of BRL9931, components for solar systems. Van der Valk Solar Systems pitched roof clamp systems are MCS012 approved (MCS BBA 0159).

- **EN 1990 Base of Structural design**

National Annexes:

- BS EN 1990:2002+A1:2005
- DIN EN 1990/NA/A1
- IS-EN 1990:2002+A1:2005
- NBN EN 1990 ANB
- NEN-EN 1990+A1+A1/C2/NB
- NS-EN 1990:2002/NA:2008+A1:2010
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- SS-EN 1990/A1:2005/AC:2010

- **EN 1991-1-3 Actions on structures / Snow load**

National Annexes:

- BS-EN 1991-1-3:2003
- DIN EN 1991-1-3/NA
- IS-EN 1991-1-3:2003
- NBN EN 1991-1-3 ANB
- NEN-EN 1991-1-3:2003
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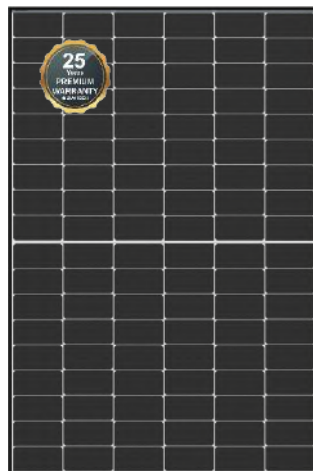
► Contact

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Ultra V Pro mini

HALF-CELL N-Type TOPCon MONOFACIAL MODULE

TYPE: STPXXXS - C54/Nshm



POWER OUTPUT

410-430W

MAX EFFICIENCY

22.0%

Features



High module conversion efficiency

Module efficiency up to **22.0%** achieved through advanced cell technology and manufacturing process



Lower operating temperature

Lower operating temperature and temperature coefficient increases the power output



Zero LID degradation

Zero LID performance with N-type cells which greatly enhances module power.



Extended wind and snow load tests

Module certified to withstand extreme wind (3800 Pascal) and snow loads (6000 Pascal) *



Excellent weak light performance

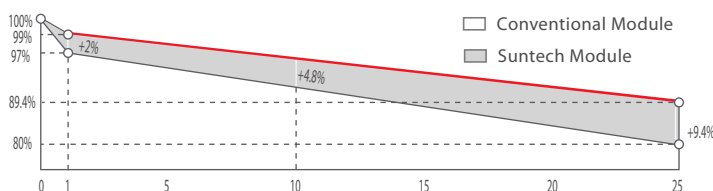
More power output in weak light condition, such as cloudy, morning and sunset



Withstanding harsh environment

Reliable quality leads to a better sustainability even in harsh environment like desert, farm and coastline

Industry-leading Warranty **



◆ First year power degradation: 1%

◆ Annual degradation: 0.40%

◆ Product warranty: 25 years

◆ linear warranty: 25 years

Certifications and Standards

CE IEC 61730 IEC 61215
SA 8000 Social Responsibility Standards
ISO 9001 Quality Management System
ISO 14001 Environment Management System
ISO 45001 Occupational Health and Safety
IEC TS 62941 Guideline for module design qualification and type approval

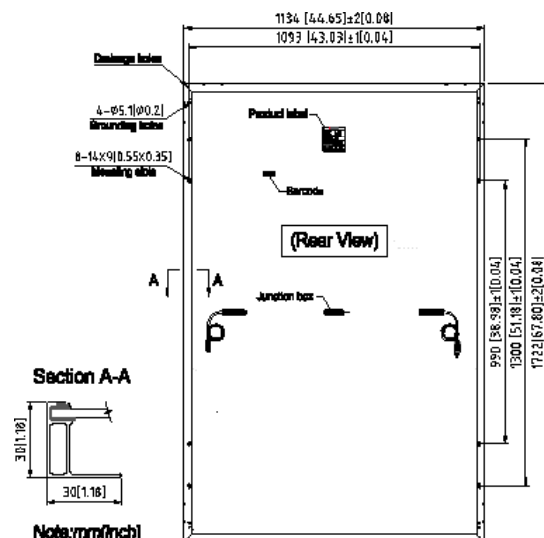


Munich RE 

Ultra V Pro STPXXXS - C54/NshM 410-430W

Mechanical Characteristics

Solar Cell	N-type Monocrystalline silicon 182 mm
No. of Cells	108 (6 × 18)
Dimensions	1722 × 1134 × 30 mm (67.8 × 44.6 × 1.2 inches)
Weight	21.0 kgs (46.3 lbs.)
Front Glass	3.2 mm (0.126 inches) fully tempered glass
Output Cables	4.0 mm ² , (-) 1400 mm (+) 1400 mm in length or customized length
Junction Box	IP68 rated (3 bypass diodes)
Operating Module Temperature	-40 °C to +85 °C
Maximum System Voltage	1500 V DC (IEC)
Connectors	MC4 EVO2
Maximum Series Fuse Rating	25 A
Power Tolerance	0/+5 W



Electrical Characteristics

Module Type	STP430S-C54/NshM		STP425S-C54/NshM		STP420S-C54/NshM		STP415S-C54/NshM		STP410S-C54/NshM	
Testing Condition	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power (P _{max} /W)	430	328.7	425	325.0	420	321.1	415	317.3	410	313.5
Optimum Operating Voltage (V _{mp} /V)	32.33	30.2	32.15	30.0	31.96	29.9	31.78	29.7	31.59	29.6
Optimum Operating Current (I _{mp} /A)	13.30	10.89	13.22	10.82	13.14	10.75	13.06	10.68	12.98	10.60
Open Circuit Voltage (V _{oc} /V)	38.72	36.8	38.59	36.6	38.46	36.5	38.33	36.4	38.20	36.3
Short Circuit Current (I _{sc} /A)	14.25	11.49	14.17	11.42	14.09	11.36	14.01	11.30	13.93	11.23
Module Efficiency (%)	22.0		21.8		21.5		21.3		21.0	

STC: Irradiance 1000 W/m², module temperature 25 °C, AM=1.5; NMOT: Irradiance 800 W/m², ambient temperature 20 °C, AM=1.5, wind speed 1 m/s; Tolerance of P_{max} is within +/- 3%;

Temperature Characteristics

Nominal Module Operating Temperature (NMOT)	42 ± 2 °C
Temperature Coefficient of P _{max}	-0.30%/°C
Temperature Coefficient of V _{oc}	-0.25%/°C
Temperature Coefficient of I _{sc}	0.046%/°C

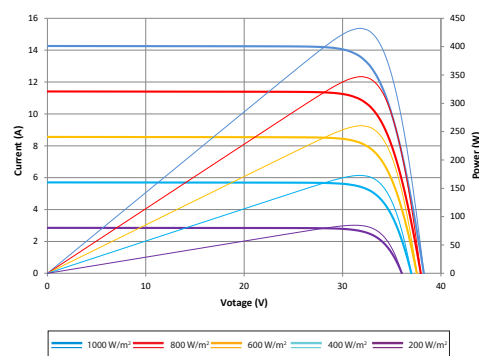
Packing Configuration

Container	40 'HC
Pieces per pallet	36
Pallets per container	26
Pieces per container	936
Packaging box dimensions	1755×1120×1255 mm
Packaging box weight	794 kg

Information on how to install and operate this product is available in the installation instruction. All values indicated in this data sheet are subject to change without prior announcement. The specifications may vary slightly. All specifications are in accordance with standard EN 50380. Color differences of the modules relative to the figures as well as discolorations of/in the modules which do not impair their proper functioning are possible and do not constitute a deviation from the specification.

Graphs

Current-Voltage & Power-Voltage Curve (430S)



S5-GC(50-70)K

Solis Three Phase Inverters



Model:

400V: S5-GC50K S5-GC60K **480V:** S5-GC60K-HV S5-GC70K-HV



Efficient

- ▶ Max. efficiency 98.7%
- ▶ String current up to **16A**
- ▶ 5/6 MPPT design, supports multiple orientation system design
- ▶ Night time PID recovery function, increases overall system yield



Safe

- ▶ IP66, C5 Anti-Corrosion Level
- ▶ Intelligent redundant fan-cooling
- ▶ Globally recognised branded componentry for longer life
- ▶ AFCI protection, proactively reduces fire risk



Smart

- ▶ Night time SVG function
- ▶ Supports export power control
- ▶ Intelligent string monitoring. Smart I-V curve scan
- ▶ Scan to register on SolisCloud, supports remote upgrade and control

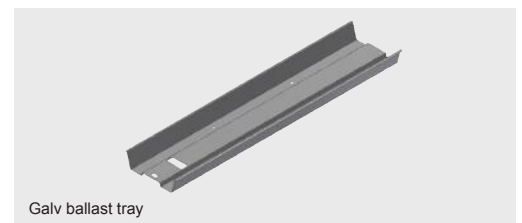


Economic

- ▶ Supports PLC/GPRS/WiFi communication with less wiring and reduced installation costs
- ▶ DC side supports "Y" connectors
- ▶ Supports aluminium wire access to reduce cost
- ▶ 10/12 string inputs allow for 150%+ DC oversizing.

Datasheet

Model Name	S5-GC50K	S5-GC60K	S5-GC60K-HV	S5-GC70K-HV
Input DC				
Max. input voltage	1100 V			
Rated voltage	600 V		720 V	
Start-up voltage	195 V			
MPPT voltage range	180-1000 V			
Max. input current	5*32 A	6*32 A		
Max. short circuit current	5*50 A	6*50 A		
MPPT number/Max. input strings number	5/10	6/12		
Output AC				
Rated output power	50 kW	60 kW	60 kW	70 kW
Max. apparent output power	55 kVA	66 kVA	66 kVA	77 kVA
Max. output power	55 kW	66 kW	66 kW	77 kW
Rated grid voltage	3/N/PE, 220 V / 380 V, 230 V / 400 V		3/PE, 480 V	
Rated grid frequency	50 Hz / 60 Hz			
Rated grid current	76.0 A / 72.2 A	91.2 A / 86.6 A	72.2 A	84.2 A
Max. output current	83.6 A	100.3 A	79.4 A	92.6 A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)			
THDi	<3%			
Efficiency				
Max. efficiency	98.7%			
CEC efficiency	98.3%		98.4%	
Protection				
DC reverse-polarity protection	Yes			
Short circuit protection	Yes			
Output over current protection	Yes			
Surge protection	DC Type II / AC Type II			
Grid monitoring	Yes			
Anti-islanding protection	Yes			
Temperature protection	Yes			
Strings monitoring	Yes			
I/V Curve scanning	Yes			
Integrated AFCI (DC arc-fault circuit protection)	Optional			
Integrated PID recovery	Optional			
Intergarated AC switch	Optional			
Intergarated DC switch	Yes			
General Data				
Dimensions (W*H*D)	691*578*338 mm			
Weight	54.5 kg			
Topology	Transformerless			
Self consumption (night)	<1 W			
Operating ambient temperature range	-25 ~ +60°C			
Relative humidity	0-100%			
Ingress protection	IP66			
Cooling concept	Intelligent redundant fan-cooling			
Max. operation altitude	4000 m			
Grid connection standard	VDE-AR-N 4105, VDE V 0124, VDE V 0126-1-1, UTE C15-712-1, NRS 097-1-2, G98, G99, EN 50549-1/-2, NTS 631, UNE 206006, UNE 206007-1, IEC61727, DEWA			
Safety/EMC standard	IEC 62109-1/-2, IEC62116 & IEC 61000-6-1/-2/-3/-4			
Features				
DC connection	MC4 connector			
AC connection	OT terminal (max. 70 mm²)			
Display	LCD, Capacitive touch buttons			
Communication	RS485, USB, Optional: Wi-Fi, GPRS, PLC			



Datasheet ValkPro+ ballast tray

The concept

- Cost effective and easy ballast solution for ValkPro+ on roofs with gravel
- For south and east-west configurations
- Available for 10° (Landscape or Portrait) and 15° (Landscape)

Article numbers

Article number	Description	H [mm]	W [mm]	Lenght [mm]	Weight per piece [Kg]
742610	Galv ballast tray ValkPro+ L10°/L15° L=1780mm	70.6	267.2	1780	4.40
742612	Galv ballast tray ValkPro+ L10°/L15° L=1980mm	70.6	267.2	1980	4.89
742615	Galv ballast tray ValkPro+ L10°/L15° L=2180mm	70.6	267.2	2180	5.39
742618	Galv ballast tray ValkPro+ L10°/L15° L=2380mm	70.6	267.2	2380	5.89
742620	Galv ballast tray ValkPro+ P10° L=1160mm	70.6	267.2	1160	2.86
742621	Galv ballast tray ValkPro+ P10° L=1360mm	70.6	267.2	1360	3.35
742622	Galv ballast tray ValkPro+ P10° L=1560mm	70.6	267.2	1560	3.85

Material

- ValkPro+ ballast trays are made from corrosion-resistant steel

Ballast capacity

- The ballast trays can be completely filled up with gravel
- The weight of the gravel per tray should always match or exceed the calculated ballast weight as shown in the ValkPVplanner project report
- The weight per tray depends on the gravel density. Always calculate and check this in advance.

Additional properties

- Easy and fast installation
- Designed and calculated according to latest building regulations
- Maximum logistical advantage by eliminating the usage of tiles and possibility to use present gravel

Calculations

- Calculations for projects with the ValkPro+ ballast trays can be made fast and easy in the ValkPVplanner. The calculations are made according to the applicable Eurocodes for each region.

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