

MSD CARLOW SOLAR PROJECT

371KWp, 300KWac

GRID INTERCONNECTED SOLAR SYSTEM

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General Notes

1. Electrical components and devices shall be suitable for their intended use e.g. industrial (heavy, light), commercial, leisure, domestic, and shall comply with the relevant Irish Standards i.e. NSAI I.S. 10101:2020. In the absence of Irish Standards, compliance shall be to available International Electrical Code.
2. A circuit-breaker in accordance with MSD Site requirements.
3. A circuit-breaker in accordance with MSD Site requirements.
4. Have an external operating handle. Live parts which are likely to be touched when resetting or adjusting devices intended for such operations while the equipment is still connected shall be protected against direct contact to at leIEct IP2X or IPXXB.
5. Functional IECpects of emergency stop equipment are given in IEC 418.
6. The contacts of manually operated emergency stop devices shall ensure positive opening operation (see IEC 60947-5-1).
7. All the electrical works to be carries out by qualified licensed electricians and all the installations must comply IS10101-2020.
8. All the PV modules and equipment to be installed must be IEC-61215 and IEC-61646 Compliant.
9. All cables installed must be IEC 60332-3 CPR compliant.
10. The PV modules are tested in accordance to IEC-61724-1:2017.
11. All the civil construction works to be carries out under IEC-1990~EN-1998.
12. All outdoor electrical installation must be minimum IP-65 Rated.
13. The PV String contains high DC voltage so do not expose wire to avoid risk of electrocution.

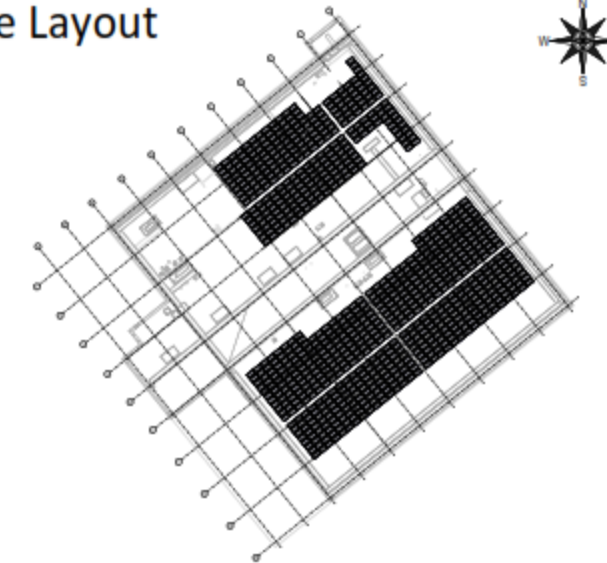
Location Map



Legend

PV MODULES	
BREAKERS	
SURGE PROTECTION DEVICE	
INVERTER	
EARTHING/ EARTH PIT	

Site Layout



- CONNECTION NOTES:
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ISSUES / REVISION			
NO.	DESCRIPTION	BY	DATE
1	PV LAYOUT UPDATED AS PER NEW ARCT. FILE	H.M	10-04-2023
2	PV LAYOUT UPDATED WITH NEW MODEL, MOUNTING STRUCTURE DETAILS AND PANEL LOCATION UPDATED	H.M	16-08-2023

PROJECT ADDRESS

MSD CARLOW
Dublin Rd, Ballyvergal, Co. Carlow,
R93 KF74,
Ireland

PROJECT NUMBER
IE-032023-PV-005

PROJECT
MSD CARLOW SOLAR PROJECT

SYSTEM OVERVIEW

SR NO.	ITEM	DESCRIPTION
1	DESIGN	ROOF MOUNTED
2	DC POWER	371 kWp
3	AC POWER	300 kW
4	AC/DC RATIO	1.20
5	ANNUAL PRODUCTION	291 MWh
6	AZIMUTH/TILT ANGLE	South East(127°): 10°Fixed Tilt
7	MIN. ANNUAL TEMP.	-14.9°C
8	MAX. ANNUAL TEMP.	30.4°C
9	DC SYSTEM VOLTAGE	1100 V
10	AC SYSTEM VOLTAGE	400 @ LV SIDE



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DRAWING TITLE
Cover Sheet

SHEET NO.
1 OF 17

CHECKED BY
ENGR. H.M

DATE
12-07-2023

DWG NO.
PV-001

Detail of Equipment

- THIS SYSTEM CONTAINS FOLLOWING MAJOR EQUIPMENTS
- 872 x 425W JA SOLAR BI-FACIAL PANELS.
 - 3 x SUN2000-100KTL-M1 GRID CONNECTED INVERTER.
 - 1 x MAIN PROTECTION PANEL (IMPORT/EXPORT METER AND REVERSE POWER PROTECTION RELAY).

Scope of Work

- THIS PROJECT IS ROOF MOUNTED SOLAR PHOTOVOLTAIC (PV) GRID-INTERCONNECTED SYSTEM WITH TOTAL CAPACITY OF 362.2 KWp AND 300kWac.
- THE ENERGY PRODUCTION WILL SUPPLY TO LOADS IN THIS BUILDING AND REMAINING GENERATED ENERGY WILL FEED INTO THE UTILITY GRID ACCORDING TO BIDIRECTIONAL ENERGY METER INSTALLATION REGULATION.

Design Codes

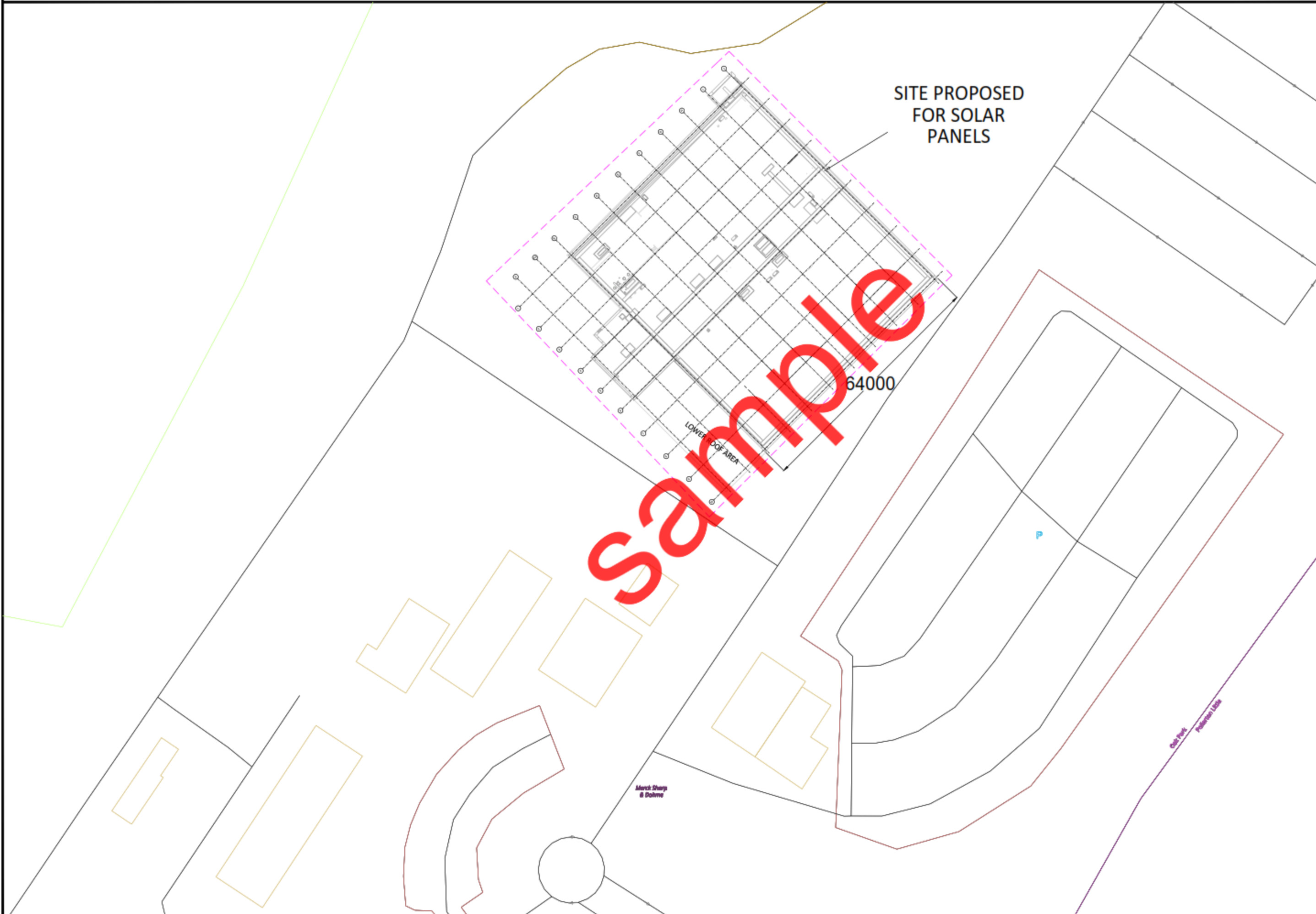
IEC-61215
IEC 62548:2016
BS AS IEC 62446-2:2020

Construction Codes

EN-1990~EN-1998
BS 7671:2008 R2011
IEC-60364
I.S. 10101:2020

Sheet List	
Sheet Number	Sheet Title
01	COVER SHEET
02	SITE LAYOUT
03	MOUNTING STRUCTURE
04	PV LAYOUT
05	PV STRING LAYOUT
06	SLD
07-08	ELEVATION
09-10	CABLE REPORT
11-14	PVSYST REPORT
15-17	CATALOGUE

SITE LAYOUT



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2	PV LAYOUT UPDATED WITH NEW MODEL, WINDTOWER STRUCTURE DETAILS, SOLAR PANEL LOCATION UPDATED	H.M	16-08-2023

PROJECT NUMBER
IE-032023-PV-003

PROJECT
MSD CARLOW SOLAR PROJECT



CONSULTANT & CONTRACTOR

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DRAWING TITLE
SITE LAYOUT

SHEET NO. 2 OF 17	 NORTH AZIMUTH 180°	
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SCALE (NTS) NOT TO SCALE	DATE 12-07-2023	DWG NO. PV-002

PV LAYOUT



872 PV MODULES OF 425W JA BIFACIAL
TOTAL POWER OF 362.2 kWp

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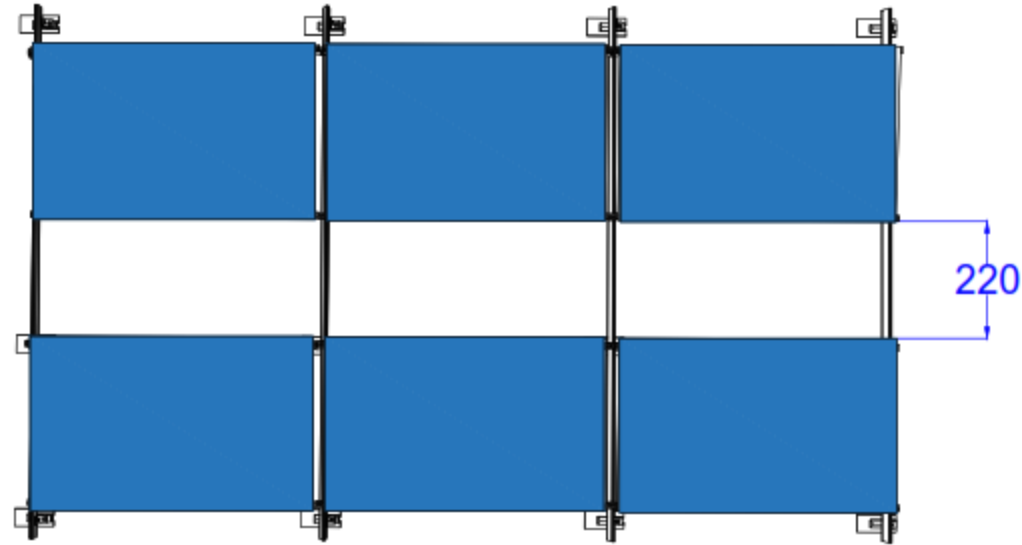
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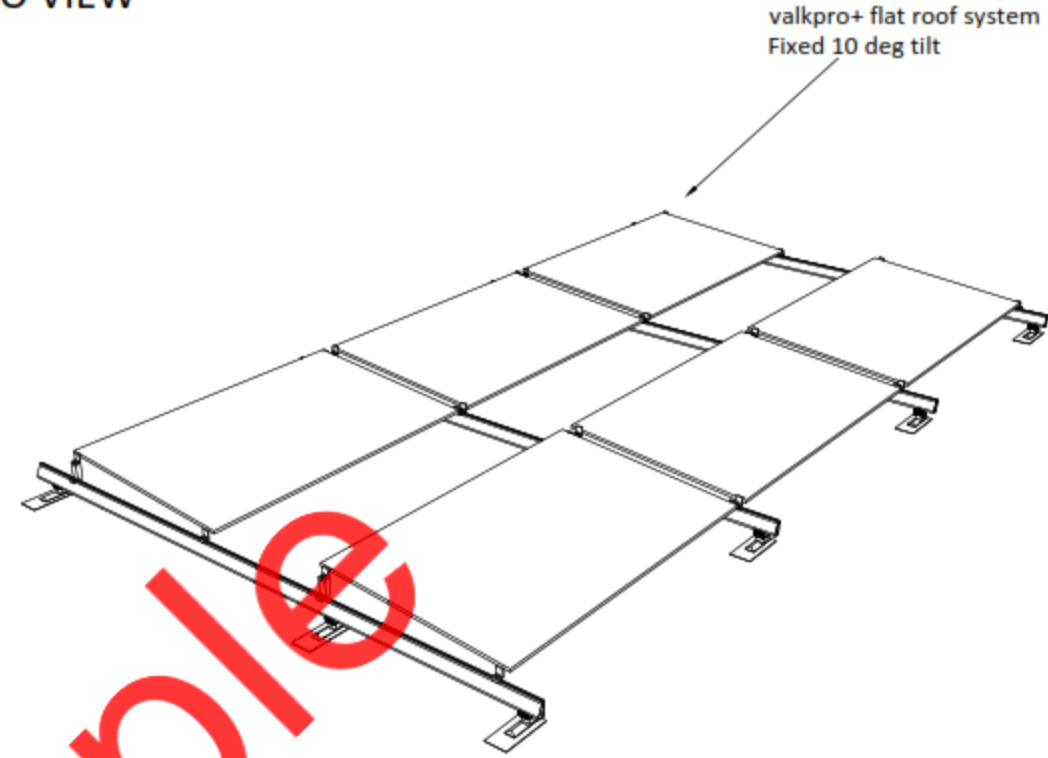
SCALE (NTS) NOT TO SCALE	DATE 12-07-2023	DWG NO. PV-003
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SOLAR MOUNTING STRUCTURE

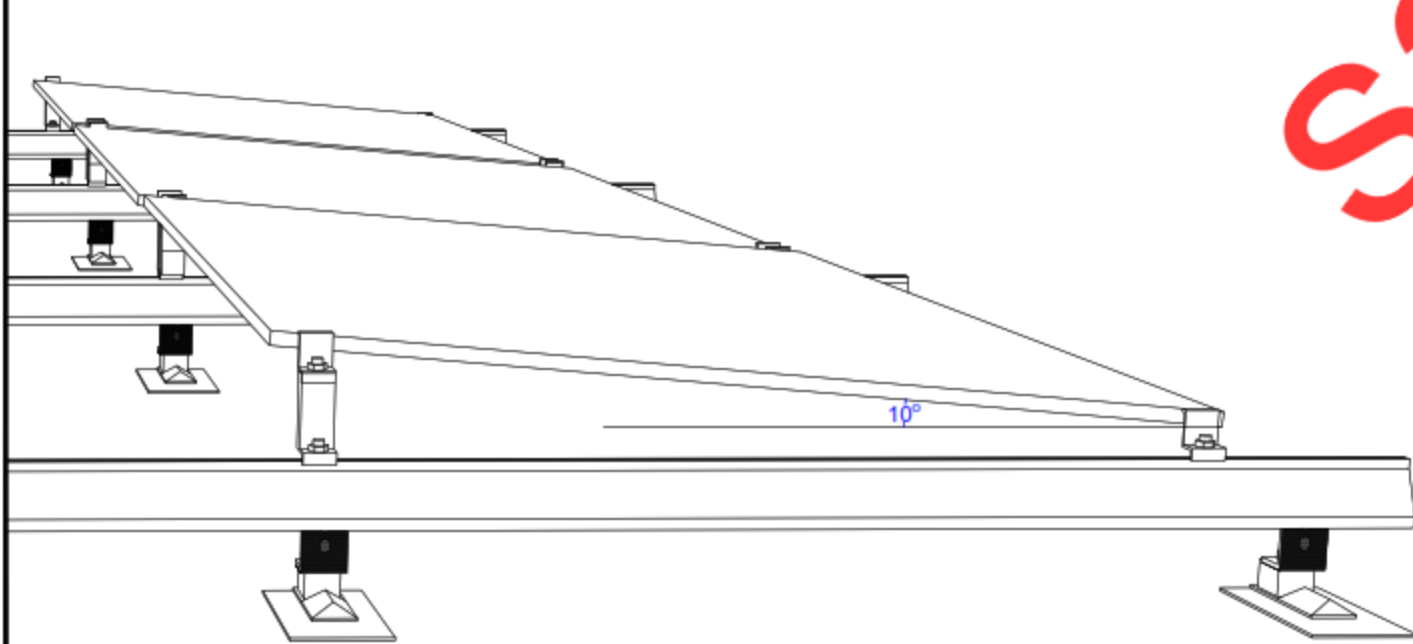
TOP VIEW



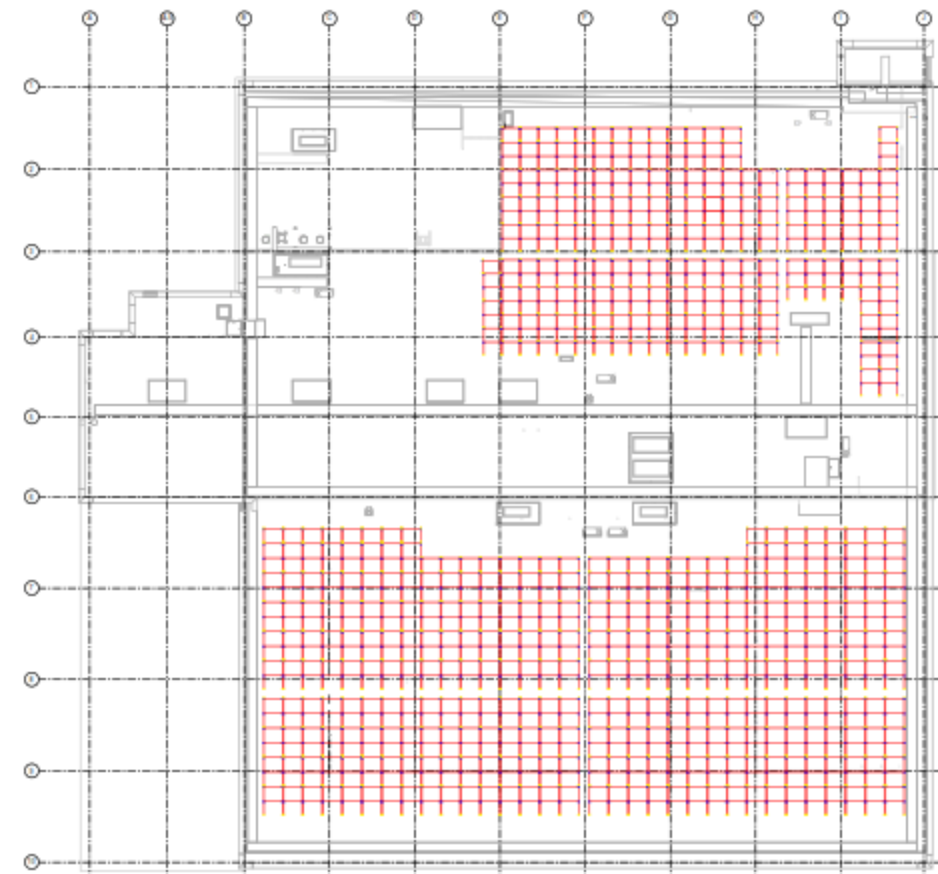
ISO VIEW



SIDE VIEW



ROOF STRUCTURE LAYOUT



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2	PV LAYOUT UPDATED WITH NEW MOUNTING STRUCTURE DETAILS AND PANEL LOCATION UPDATED	H.M	16-08-2023

PROJECT NUMBER
IE-032023-PV-003

PROJECT
MSD CARLOW SOLAR PROJECT



CONSULTANT & CONTRACTOR

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DRAWING TITLE
SOLAR MOUNTING STRUCTURE

SHEET NO.
4 OF 17

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Sample

PV STRING LAYOUT



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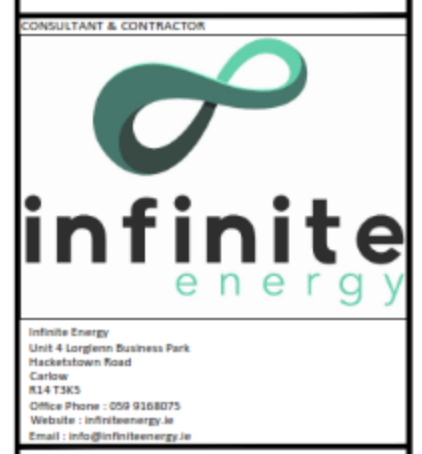
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MSD CARLOW SOLAR PROJECT



DRAWING TITLE
PV STRING LAYOUT

INV 1 (10 MPPT EACH WITH 2 INPUTS) INV 2 (10 MPPT EACH WITH 2 INPUTS) INV 3 (10 MPPT EACH WITH 2 INPUTS)

- | | | |
|--------------------------------------|--------------------------------------|-------------------------------------|
| STRING#01 (24 PANELS) = MPPT-1 IN-1 | STRING#13 (24 PANELS) = MPPT-1 IN-1 | STRING#25 (24 PANELS) = MPPT-1 IN-1 |
| STRING#02 (24 PANELS) = MPPT-2 IN-1 | STRING#14 (24 PANELS) = MPPT-2 IN-1 | STRING#26 (24 PANELS) = MPPT-1 IN-2 |
| STRING#03 (24 PANELS) = MPPT-3 IN-1 | STRING#15 (24 PANELS) = MPPT-3 IN-1 | STRING#27 (24 PANELS) = MPPT-2 IN-1 |
| STRING#04 (24 PANELS) = MPPT-4 IN-1 | STRING#16 (24 PANELS) = MPPT-4 IN-1 | STRING#28 (24 PANELS) = MPPT-2 IN-2 |
| STRING#05 (24 PANELS) = MPPT-5 IN-1 | STRING#17 (24 PANELS) = MPPT-5 IN-1 | STRING#29 (25 PANELS) = MPPT-3 IN-1 |
| STRING#06 (24 PANELS) = MPPT-6 IN-1 | STRING#18 (24 PANELS) = MPPT-6 IN-1 | STRING#30 (25 PANELS) = MPPT-3 IN-2 |
| STRING#07 (24 PANELS) = MPPT-7 IN-1 | STRING#19 (24 PANELS) = MPPT-7 IN-1 | STRING#31 (25 PANELS) = MPPT-4 IN-1 |
| STRING#08 (24 PANELS) = MPPT-8 IN-1 | STRING#20 (24 PANELS) = MPPT-8 IN-1 | STRING#32 (25 PANELS) = MPPT-4 IN-2 |
| STRING#09 (24 PANELS) = MPPT-9 IN-1 | STRING#21 (24 PANELS) = MPPT-9 IN-1 | STRING#33 (25 PANELS) = MPPT-5 IN-1 |
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| STRING#11 (24 PANELS) = MPPT-1 IN-2 | STRING#23 (24 PANELS) = MPPT-1 IN-2 | STRING#35 (25 PANELS) = MPPT-6 IN-1 |
| STRING#12 (24 PANELS) = MPPT-2 IN-2 | STRING#24 (24 PANELS) = MPPT-2 IN-2 | STRING#36 (25 PANELS) = MPPT-6 IN-2 |

MATERIAL SCHEDULE

DESCRIPTION	UNIT	QTY.
425W JA SOLAR BI FACIAL	NO.	872
SUN2000-100KTL-M1	NO.	3
MCCB 4P200A	NO.	3
DC WIRE 480C QU/UL75E/PVC APPROX.	MT.	7420

INVERTER SPECIFICATIONS

SUN2000-100KTL-M1 3P-N

Max AC Power Rating	100 kW
Max Input DC Voltage	1100 V
Min AC Power Rating	0 W
Min Input DC Voltage	200 V

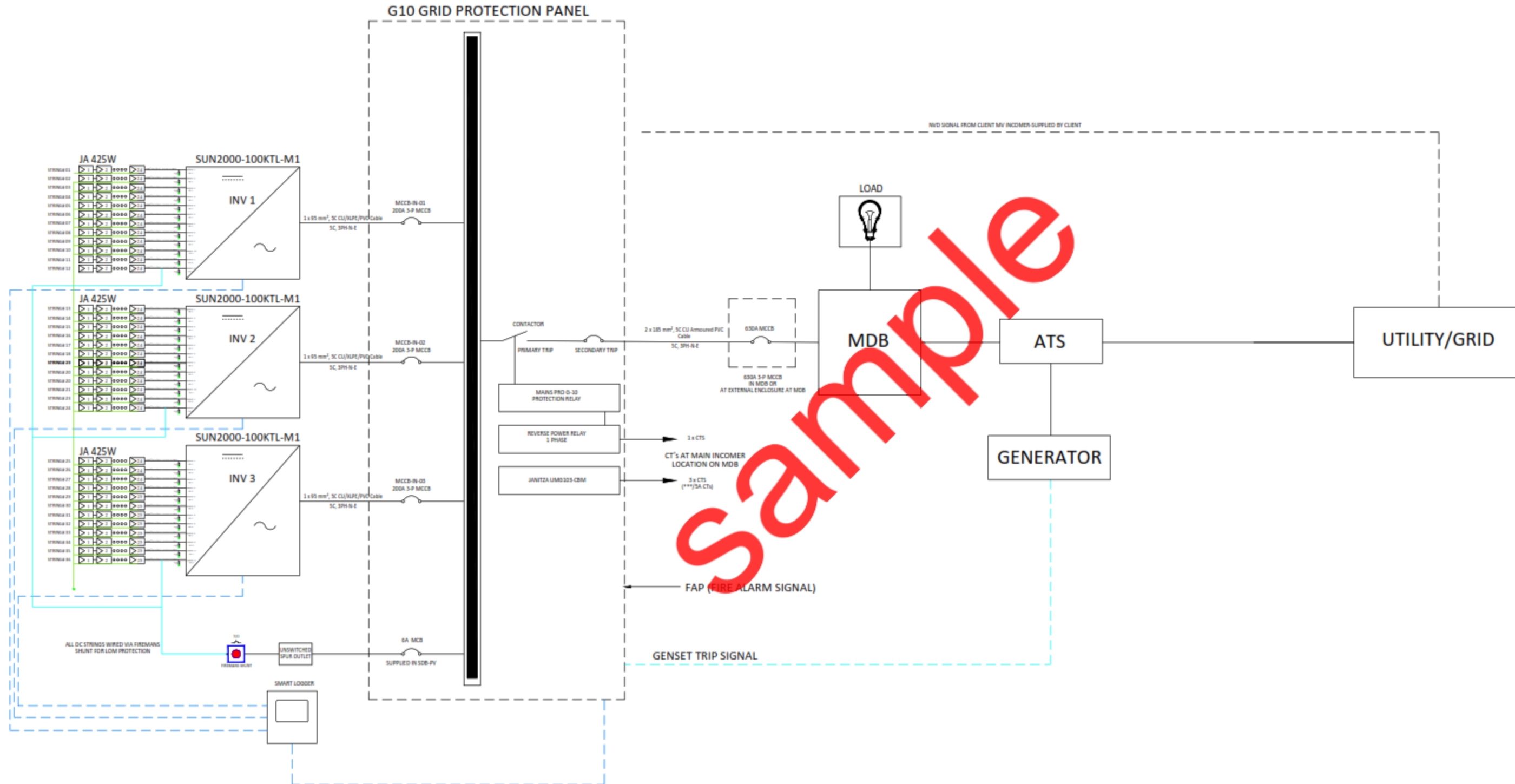
MODULE SPECIFICATION

425W JA SOLAR BI FACIAL

STC Rating	425 W
Vmp	38.20 V
Imp	13.28 A
Voc	32.01
Isc	14.16 A

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ENGR. H.M	DATE	DWG NO.
12-07-2023	12-07-2023	PV-005

SLD



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2	PV LAYOUT CORRECTED WITH NEW MODEL, MISIDENTIFIED STRUCTURE DETAILS AND PANEL LOCATION UPDATED	H.M	16-08-2023

PROJECT NUMBER
IE-032023-PV-003

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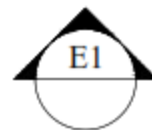
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SHEET NO.
6 OF 17

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SCALE (NTS) NOT TO SCALE	DATE 12-07-2023	DWG NO. PV-006
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ELEVATION



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DRAWING TITLE
ELEVATION

SHEET NO. 7 OF 17		
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ELEVATION

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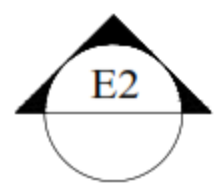
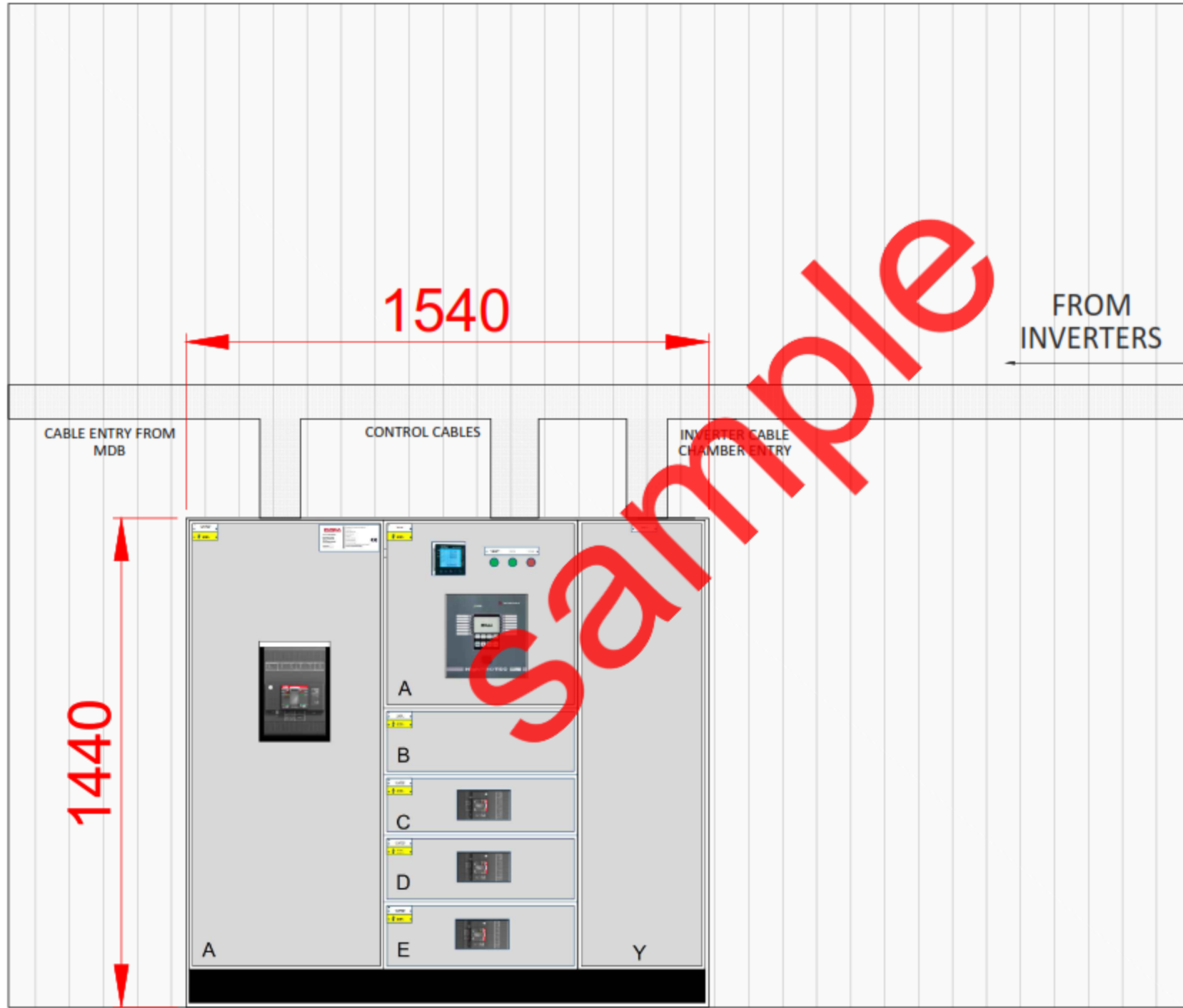
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DRAWING TITLE
ELEVATION

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CABLE REPORT

Cable Size Report

Project name: MSD Carlow
 Calculation name: AC cable sizing Inverter to G10 Panel
 Cable: Multi-core / Thermoplastic (70 °C) / Copper Solid/Stranded / Armoured
 Installation: D Multi-core Cable On Ladder Rack

Load:	160.4 A	Power factor:	0.8
Supply:	3 phase	400 V	Fault level: 3 kA
Length of run:	110 m		

Cable Size Results

Current-carrying Capacity: PASS

Active cable:	1 x 95 mm ² , 3/4C	Current rating of circuit-derated:	188 A
Neutral cable:	1 x 95 mm ² , 3/4C	Spare current-carrying capacity of circuit:	28 A
Earth cable (copper):	1 x 50 mm ² , 1C	Overall derating factor:	0.75
Dictating factor for active size:	Current	Conductor operating temperature:	59.04 °C

Fault Loop Impedance:

Voltage Drop: PASS

Total loop, Zs:	0.0726 Ω	Voltage drop:	7.22 V
Source, Zext:	0.0145 Ω	Voltage drop:	1.8 %
Cables, Zint:	0.0581 Ω	Permissible voltage drop:	2.5 %
Maximum allowed, Zdevice:	-	Maximum length of run:	152.43 m
Touch voltage:	85.53 V		

Short-circuit Performance: PASS

Three Ph. Short-cct:	2825.7 A
Min. active size to withstand short-circuit:	7.28 mm ²
Active-to-earth short-circuit current:	1617.4 A
Min. earth size to withstand short-circuit:	3.58 mm ²

Protective Device: Unknown

Rating:	-	Duration of Short-circuit:	0.1 s
Thermal setting:	-	Earth fault time:	-
Trip current:	-	RCD:	-

References

Standards: NSAI IS10101 Standard

Tabulated current rating of cable: 251 A

Table name: 4D4A
 Column No. 5

Conductor impedances used in voltage drop calculations

Resistance		Reactance	
Phase conductor:	0.41 Ω/km	Phase conductor:	0.135 Ω/km
Table name:	4D4B	Table name:	4D4B
Column No. :	4	Column No. :	4

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NO.	DESCRIPTION	BY	DATE
1	PV LAYOUT UPDATED AS PER NEW ARCT. FILE	H.M	10-04-2023
2	PV LAYOUT UPDATED WITH NEW MODEL, WINDING STRUCTURE DETAILS AND PANEL LOCATION UPDATED	H.M	16-08-2023

PROJECT NUMBER
IE-032023-PV-003

PROJECT
MSD CARLOW SOLAR PROJECT



Infinite Energy
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DRAWING TITLE
CABLE REPORT

SHEET NO.
 9 OF 17

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SCALE (NTS) NOT TO SCALE	DATE 12-07-2023	DWG NO. PV-009
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CABLE REPORT

Cable Size Report

Project name: MSD Carlow
 Calculation name: MAIN AC CABLE
 Cable: Multi-core / Thermoplastic (70 °C) / Copper Solid/Stranded / Armoured
 Installation: D Multi-core Cable On Ladder Rack

Load:	481 A	Power factor:	0.8
Supply:	3 phase	400 V	Fault level: 3 kA
Length of run:	15 m		

Cable Size Results

Current-carrying Capacity: PASS

Active cable:	2 x 185 mm ² , 3/4C	Current rating of circuit-derated:	486 A
Neutral cable:	2 x 185 mm ² , 3/4C	Spare current-carrying capacity of circuit:	5 A
Earth cable (copper):	1 x 185 mm ² , 1C	Overall derating factor:	1
Dictating factor for active size:	Current	Conductor operating temperature:	68.98 °C

Fault Loop Impedance:

Voltage Drop: PASS

Total loop, Zs:	0.0028 Ω	Voltage drop:	0.44 V
Source, Zext:	0.0006 Ω	Voltage drop:	0.11 %
Cables, Zint:	0.0023 Ω	Permissible voltage drop:	2.5 %
Maximum allowed, Zdevice:	-	Maximum length of run:	338.05 m
Touch voltage:	5.98 V		

Short-circuit Performance: PASS

Three Ph. Short-cct:	2999.5 A
Min. active size to withstand short-circuit:	9.17 mm ²
Active-to-earth short-circuit current:	2656.2 A
Min. earth size to withstand short-circuit:	5.62 mm ²

Protective Device: Unknown

Rating:	-	Duration of Short-circuit:	0.1 s
Thermal setting:	-	Earth fault time:	-
Trip current:	-	RCD:	-

References

Standards: NSAI IS10101 Standard

Tabulated current rating of cable: 243 A

Table name: 4D4A
 Column No. 7

Conductor impedances used in voltage drop calculations

Resistance		Reactance	
Phase conductor:	0.105 Ω/km	Phase conductor:	0.065 Ω/km
Table name:	4D4B	Table name:	4D4B
Column No. :	4	Column No. :	4

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2	PV LAYOUT UPDATED WITH NEW MODEL, WIDENING STRUCTURE DETAILS AND PANEL LOCATION UPDATED	H.M	16-08-2023

PROJECT NUMBER
IE-032023-PV-003

PROJECT
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CABLE REPORT

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PV SYST REPORT



Version 7.3.1

PVsyst - Simulation report

Grid-Connected System

Project: MSD Carlow

Variant: Grid Connected System

Tables on a building

System power: 371 kWp

Ballylennon Cross Roads - Ireland

Author



PVsyst V7.3.1

VC0, Simulation date:
08/17/23 12:19
with v7.3.1

Project: MSD Carlow

Variant: Grid Connected System

Project summary

Geographical Site Ballylennon Cross Roads Ireland	Situation Latitude 52.86 °N Longitude -6.88 °W Altitude 86 m Time zone UTC	Project settings Albedo 0.20
--	---	--

Meteo data
Ballylennon Cross Roads
Meteonorm 8.1 (1991-2009), Sat=67% - Synthetic

System summary

Grid-Connected System Simulation for year no 10	Tables on a building	User's needs Unlimited load (grid)
PV Field Orientation Fixed plane Tilt/Azimuth 10 / -53 °	Near Shadings Linear shadings	
System information PV Array Nb. of modules 872 units Pnom total 371 kWp	Inverters Nb. of units 3 units Pnom total 300 kWac Pnom ratio 1.238	

Results summary

Produced Energy	291163 kWh/year	Specific production	784 kWh/kWp/year	Perf. Ratio PR	78.89 %
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Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Near shading definition - Iso-shadings diagram	5
Main results	6
Loss diagram	7
Predef. graphs	8
Single-line diagram	9

08/17/23

Page 2/9

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PROJECT NUMBER
IE-032023-PV-003

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PV SYST REPORT



Project: MSD Carlow
Variant: Grid Connected System

PVsyst V7.3.1
VC0, Simulation date:
08/17/23 12:19
with v7.3.1

General parameters

Grid-Connected System

PV Field Orientation

Orientation
Fixed plane
Tilt/Azimuth 10 / -53 °

Tables on a building

Sheds configuration

Nb. of sheds 872 units
Sizes
Sheds spacing 1.62 m
Collector width 1.13 m
Ground Cov. Ratio (GCR) 70.1 %

Shading limit angle

Limit profile angle 21.5 °

Horizon

Free Horizon

Near Shadings

Linear shadings

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer JA Solar
Model JAM54D-40-425-GB
(Custom parameters definition)

Unit Nom. Power 425 Wp
Number of PV modules 872 units
Nominal (STC) 371 kWp
Modules 46 Strings x 19 in series

At operating cond. (50°C)

Pmpp 339 kWp
U mpp 548 V
I mpp 619 A

Total PV power

Nominal (STC) 371 kWp
Total 874 modules
Module area 1754 m²

Inverter

Manufacturer Huawei Technologies
Model SUN2000-100KTL-M1-400Vac
(Original PVsyst database)

Unit Nom. Power 100 kWac
Number of inverters 3 units
Total power 300 kWac
Operating voltage 200-1000 V
Max. power (=>33°C) 110 kWac
Pnom ratio (DC:AC) 1.24
Power sharing within this inverter

Total inverter power

Total power 300 kWac
Number of inverters 3 units
Pnom ratio 1.24

Array losses

Array Soiling Losses

Loss Fraction 3.0 %

Thermal Loss factor

Module temperature according to irradiance
Uc (const) 20.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

DC wiring losses

Global array res. 15 mΩ
Loss Fraction 1.5 % at STC

LID - Light Induced Degradation

Loss Fraction 2.0 %

Module Quality Loss

Loss Fraction -0.8 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

Module average degradation

Year no 10
Loss factor 0.4 %/year

Mismatch due to degradation

Imp RMS dispersion 0.4 %/year
Vmp RMS dispersion 0.4 %/year

IAM loss factor

Incidence effect (IAM): Fresnel smooth glass, n = 1.526

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.998	0.981	0.948	0.862	0.776	0.636	0.403	0.000



Project: MSD Carlow
Variant: Grid Connected System

PVsyst V7.3.1
VC0, Simulation date:
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with v7.3.1

Array losses

Spectral correction

FirstSolar model
Precipitable water estimated from relative humidity

Coefficient Set	C0	C1	C2	C3	C4	C5
Monocrystalline Si	0.85914	-0.02088	-0.0058853	0.12029	0.026814	-0.001781

System losses

Auxiliaries loss

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PROJECT NUMBER
IE-032023-PV-003

PROJECT
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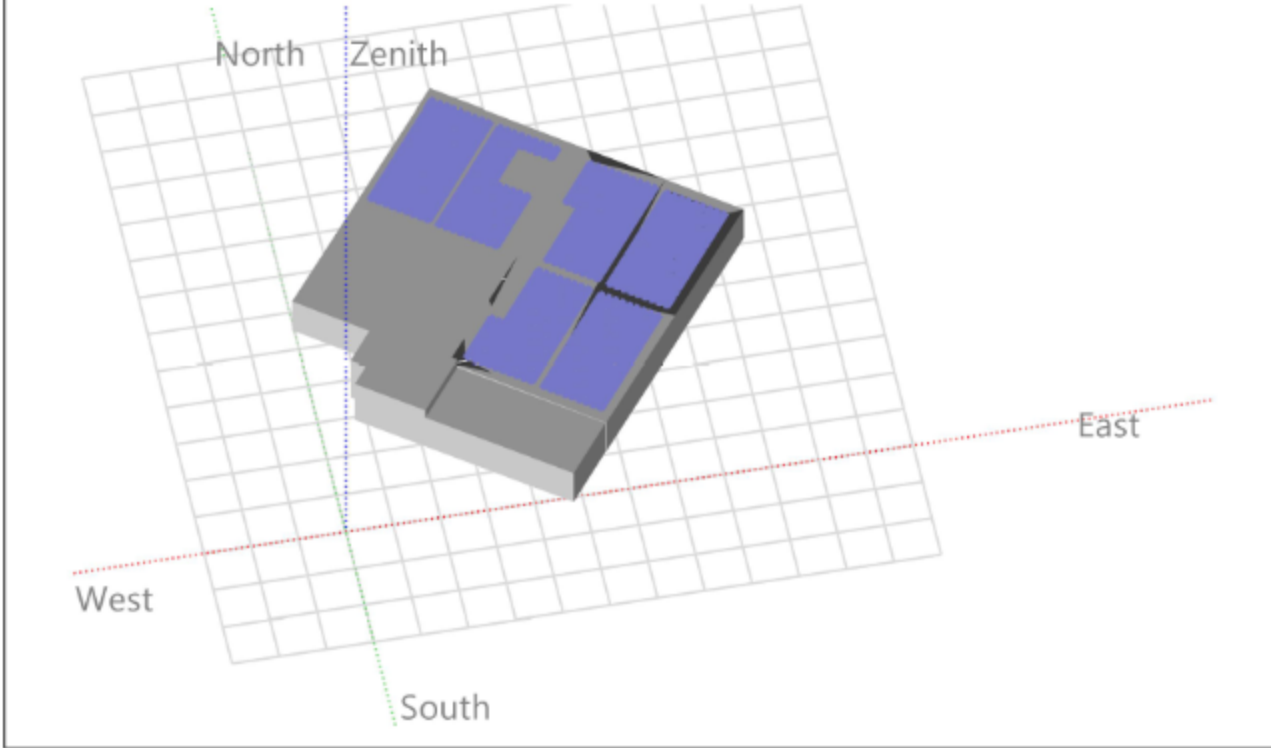


Project: MSD Carlow
Variant: Grid Connected System

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with v7.3.1

Near shadings parameter

Perspective of the PV-field and surrounding shading scene

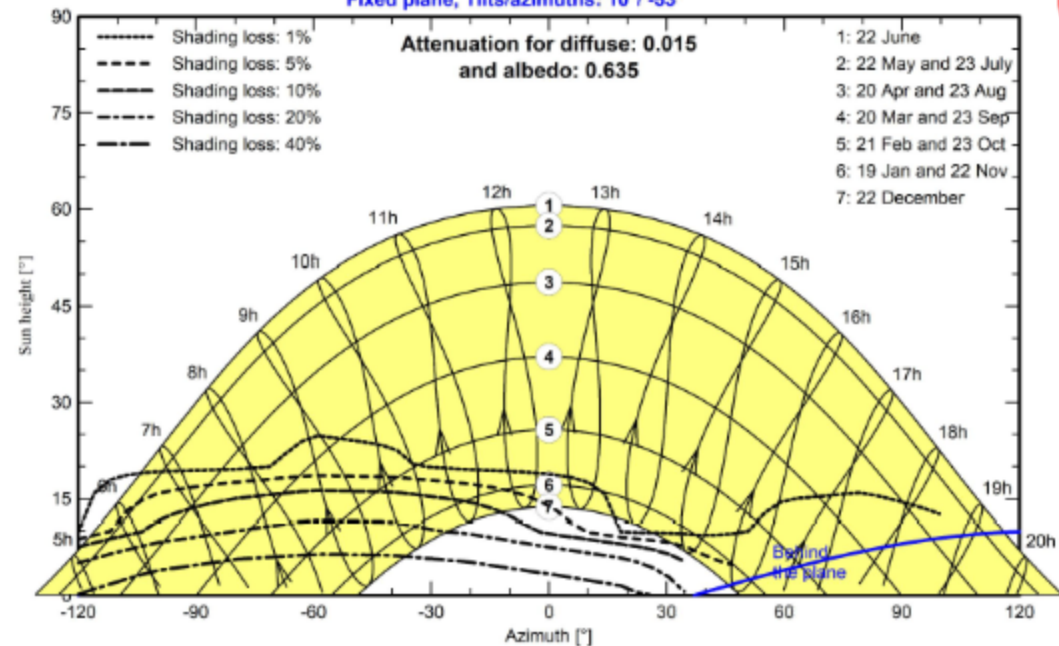


Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 10° / -53°

Attenuation for diffuse: 0.015
and albedo: 0.635



Project: MSD Carlow
Variant: Grid Connected System

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Main results

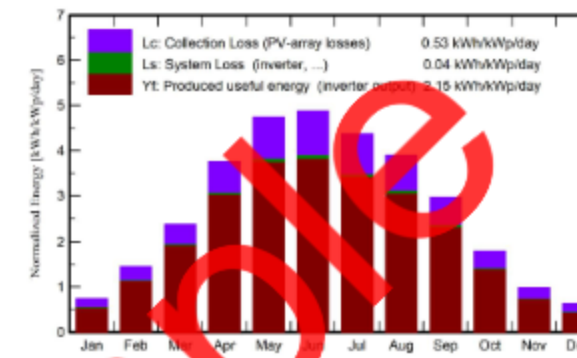
System Production
Produced Energy

291163 kWh/year

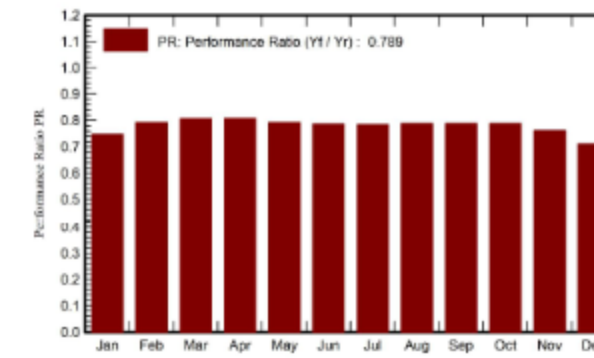
Specific production
Performance Ratio PR

784 kWh/kWp/year
78.89 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	20.1	13.71	5.50	23.2	19.1	6584	6433	0.748
February	35.7	20.35	5.26	40.5	35.3	12144	11913	0.792
March	70.6	41.36	6.52	74.1	67.1	22643	22227	0.807
April	109.1	61.71	8.29	112.7	103.5	34458	33820	0.808
May	144.1	73.28	11.32	147.2	136.2	44238	43364	0.793
June	145.3	78.37	14.00	146.2	135.7	43640	42747	0.787
July	135.0	80.98	15.61	135.5	125.2	40275	39467	0.784
August	118.1	72.37	15.35	120.7	111.0	36056	35343	0.788
September	84.7	40.79	13.24	89.0	80.9	26617	26078	0.789
October	50.8	28.99	10.56	55.4	49.1	16559	16233	0.788
November	25.7	15.94	7.38	29.5	24.9	8517	8336	0.761
December	16.3	10.44	5.84	19.7	15.6	5338	5200	0.711
Year	955.4	538.30	9.93	993.6	903.5	297069	291163	0.789

Legends

GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		

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2	PV-002 CONNECTED WITH NEW MODEL, WINDTOWER STRUCTURE DETAILS AND PANEL LOCATION UPDATED	H.M	16-08-2023

PROJECT NUMBER
IE-032023-PV-003

PROJECT
MSD CARLOW SOLAR PROJECT



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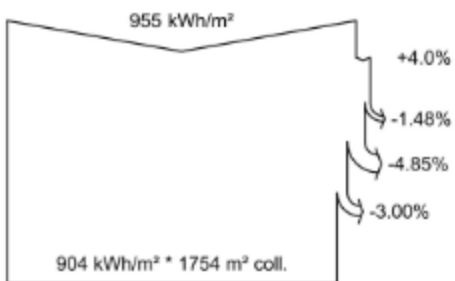
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PVsyst V7.3.1
VC0, Simulation date:
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Project: MSD Carlow
Variant: Grid Connected System

Loss diagram



Global horizontal irradiation
Global incident in coll. plane

Near Shadings: irradiance loss

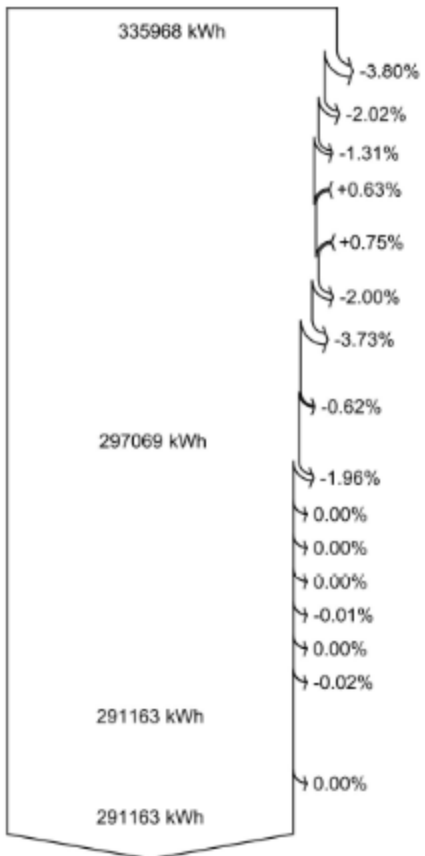
IAM factor on global

Soiling loss factor

Effective irradiation on collectors

PV conversion

efficiency at STC = 21.20%



Array nominal energy (at STC effic.)

Module Degradation Loss (for year #10)

PV loss due to irradiance level

PV loss due to temperature

Spectral correction

Module quality loss

LID - Light induced degradation

Mismatch loss, modules and strings
(including 1.6% for degradation dispersion)

Ohmic wiring loss

Array virtual energy at MPP

Inverter Loss during operation (efficiency)

Inverter Loss over nominal inv. power

Inverter Loss due to max. input current

Inverter Loss over nominal inv. voltage

Inverter Loss due to power threshold

Inverter Loss due to voltage threshold

Night consumption

Available Energy at Inverter Output

Auxiliaries (fans, other)

Energy injected into grid

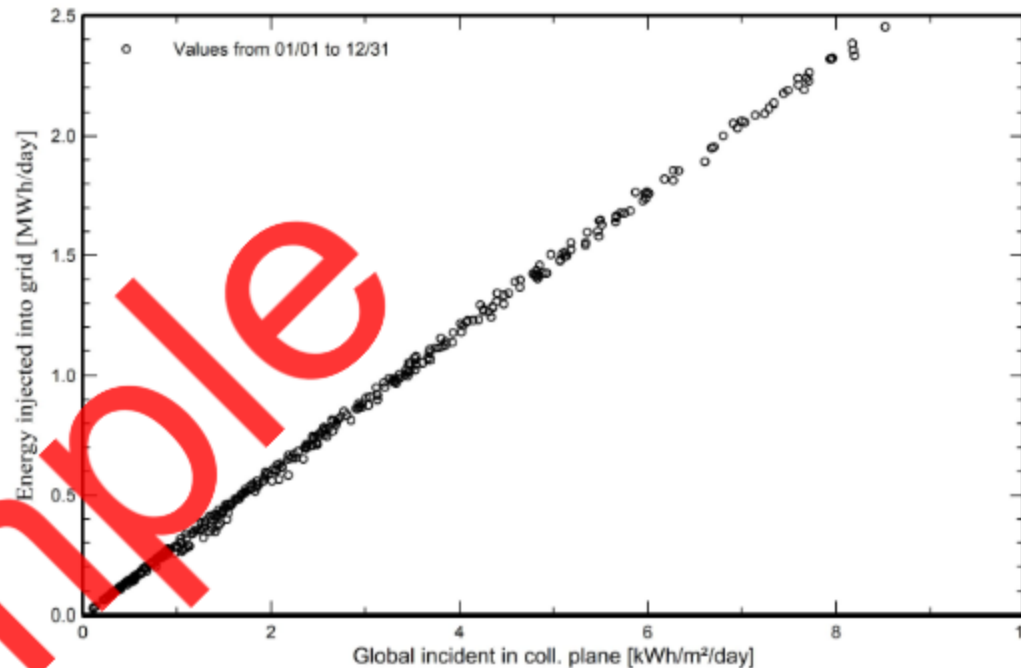


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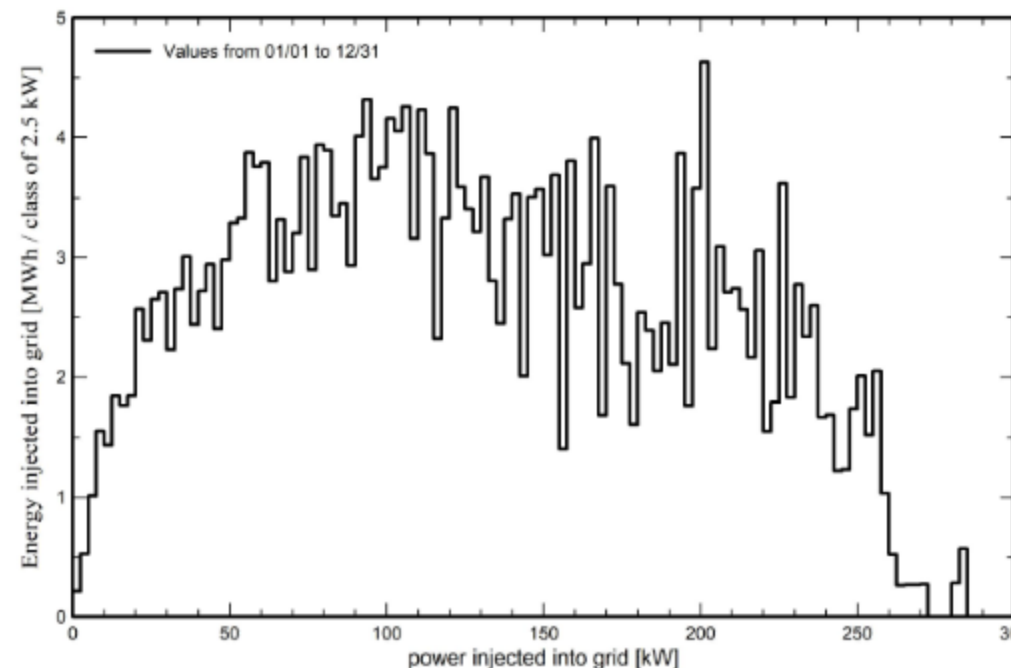
Project: MSD Carlow
Variant: Grid Connected System

Predef. graphs

Daily Input/Output diagram



System Output Power Distribution



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CATALOGUE

Smart String Inverter



SUN2000-100KTL-M1



Smart

Smart I-V Curve Diagnosis supported



Efficient

Max. efficiency 98.8%



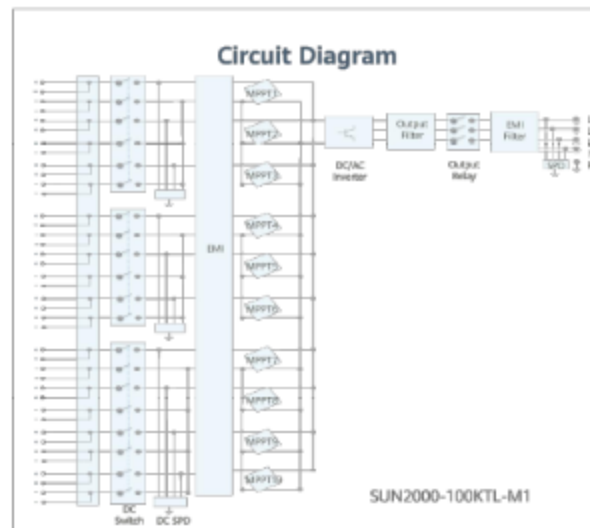
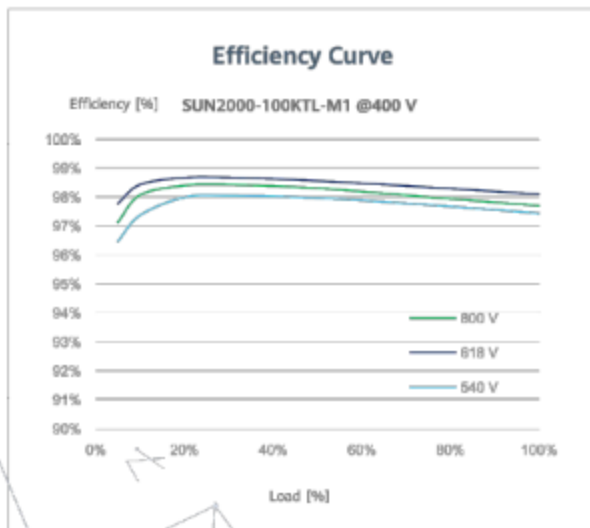
Safe

Fuse free design



Reliable

Type II surge arresters for DC & AC



SUN2000-100KTL-M1 Technical Specification

Technical Specification		SUN2000-100KTL-M1
Efficiency		
Max. efficiency	98.8% @480 V, 98.6% @380 V / 400 V	
European efficiency	98.6% @480 V, 98.4% @380 V / 400 V	
Input		
Max. Input Voltage ¹	1,100 V	
Max. Current per MPPT	26 A	
Max. Short Circuit Current per MPPT	40 A	
Start Voltage	200 V	
MPPT Operating Voltage Range ²	200 V ~ 1,000 V	
Nominal Input Voltage	720 V @480 Vac, 600 V @400 Vac, 570 V @380 Vac	
Number of MPP trackers	10	
Max. number of inputs	20	
Output		
Nominal AC Active Power	100,000 W	
Max. AC Apparent Power	110,000 VA	
Max. AC Active Power (cosφ=1)	110,000 W	
Nominal Output Voltage	480 V/ 400 V/ 380 V, 3W+(N)+PE	
Rated AC Grid Frequency	50 Hz / 60 Hz	
Nominal Output Current	120.3 A @480 V, 144.4 A @400 V, 152.0 A @380 V	
Max. Output Current	133.7 A @480 V, 160.4 A @400 V, 168.8 A @380 V	
Adjustable Power Factor Range	0.8 leading... 0.8 lagging	
Max. Total Harmonic Distortion	< 3%	
Protection		
Input-side Disconnection Device	Yes	
Anti-Islanding Protection	Yes	
AC Overcurrent Protection	Yes	
DC Reverse-polarity Protection	Yes	
PV-array String Fault Monitoring	Yes	
DC Surge Arrester	Type II	
AC Surge Arrester	Type II	
DC Insulation Resistance Detection	Yes	
Residual Current Monitoring Unit	Yes	
Communication		
Display	LED indicators; WLAN adaptor + FusionSolar APP	
RS485	Yes	
USB	Yes	
Monitoring BUS (MBUS)	Yes (isolation transformer required)	
General Data		
Dimensions (W x H x D)	1,035 x 700 x 365 mm	
Weight (with mounting plate)	90 kg	
Operating Temperature Range	-25°C ~ 60°C	
Cooling Method	Smart Air Cooling	
Max. Operating Altitude without Derating	4,000 m	
Relative Humidity	0 ~ 100%	
DC Connector	Staubli MC4	
AC Connector	Waterproof Connector + OT/DT Terminal	
Protection Degree	IP66	
Topology	Transformerless	
Nighttime Power Consumption	< 3.5 W	
Standard Compliance (more available upon request)		
Certificate	EN 62109-1/-2, IEC 62109-1/-2, EN 50530, IEC 62116, IEC 61727, IEC 60068, IEC 61683	
Grid Connection Standards	VDE-AR-N4105, EN 50549-1, EN 50549-2, RD 661, RD 1699, C10/11, DEWA, G99, NRS 097-2-1	

¹ The maximum input voltage is the upper limit of the DC voltage. Any higher input DC voltage would probably damage inverter.
² Any DC input voltage beyond the operating voltage range may result in inverter improper operating.

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ISSUES / REVISION

NO.	DESCRIPTION	BY	DATE
1	PV LAYOUT UPDATED AS PER NEW ARCT. FILE	H.M	10-04-2023
2	PV LAYOUT UPDATED WITH NEW MODEL, MOUNTING STRUCTURE DETAILS AND PANEL LOCATION UPDATED	H.M	16-08-2023

PROJECT NUMBER
IE-032023-PV-003

PROJECT
MSD CARLOW SOLAR PROJECT



Infinite Energy
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Hackettstown Road
Carlow
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DRAWING TITLE
CATALOGUE

SHEET NO. 15 OF 17	CHECKED BY ENGR. H.M	SCALE (NTS) NOT TO SCALE	DATE 12-07-2023	DWG NO. PV-015
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CATALOGUE

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Introduction

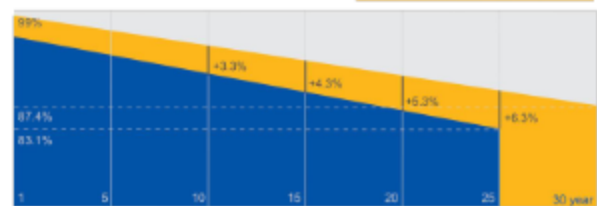
Powered by the latest SMBB n-type solar cell and half-cell configuration, these modules have higher output power, lower LID, better weak illumination response, and better temperature coefficient.

- Higher power generation better LCOE
- n-type with very Lower LID
- Better weak illumination response
- Better Temperature Coefficient

Superior Warranty

- 12-year product warranty
- 30-year linear power output warranty

1% 1st-year Degradation
0.4% Annual Degradation Over 30 years



n-type Bifacial Double Glass Module Linear Performance Warranty
Standard Module Linear Performance Warranty

Comprehensive Certificates

- IEC 61215, IEC 61730
- ISO 9001: 2015 Quality management systems
- ISO 14001: 2015 Environmental management systems
- ISO 45001: 2018 Occupational health and safety management systems
- IEC 62941: 2019 Terrestrial photovoltaic (PV) modules - Quality system for PV module manufacturing



www.jasolar.com

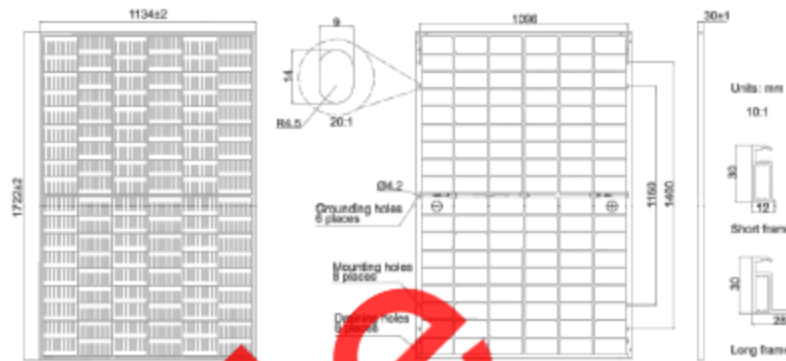
Specifications subject to technical changes and tests. JA Solar reserves the right of final interpretation.



JA SOLAR

JAM54D40 410-435/GB Series

MECHANICAL DIAGRAMS



Remark: customized frame color and cable length are available upon request.

SPECIFICATIONS

Cell	Mono-16BB
Weight	21.5kg
Dimensions	1722±2mm×1134±2mm×30±1mm
Cable Cross Section Size	4mm ² (IEC), 12 AWG(UL)
No. of cells	108(6×18)
Junction Box	IP68, 3 diodes
Connector	QC 4.10-35I/ MC4-EVO2A
Cable Length (Including Connector)	Portrait: 200mm(+)/300mm(-), 800mm(+)/800mm(-)(Leapfrog) Landscape: 1100mm(+)/1100mm(-)
Front Glass/Back Glass	1.6mm/1.6mm
Packaging Configuration	36pcs/Pallet, 936pcs/40HQ Container

ELECTRICAL PARAMETERS AT STC

TYPE	JAM54D40 -410/GB	JAM54D40 -415/GB	JAM54D40 -420/GB	JAM54D40 -425/GB	JAM54D40 -430/GB	JAM54D40 -435/GB
Rated Maximum Power (Pmax) [W]	410	415	420	425	430	435
Open Circuit Voltage (Voc) [V]	37.82	37.92	38.05	38.20	38.32	38.45
Maximum Power Voltage (Vmpp) [V]	31.37	31.59	31.80	32.01	32.21	32.42
Short Circuit Current (Isc) [A]	13.95	14.02	14.09	14.16	14.23	14.30
Maximum Power Current (Imp) [A]	13.07	13.14	13.21	13.28	13.35	13.42
Module Efficiency [%]	21.0	21.3	21.5	21.8	22.0	22.3
Power Tolerance	0~+5W					
Temperature Coefficient of Isc(α _{Isc})	+0.046%/°C					
Temperature Coefficient of Voc(β _{Voc})	-0.260%/°C					
Temperature Coefficient of Pmax(γ _{Pmp})	-0.300%/°C					

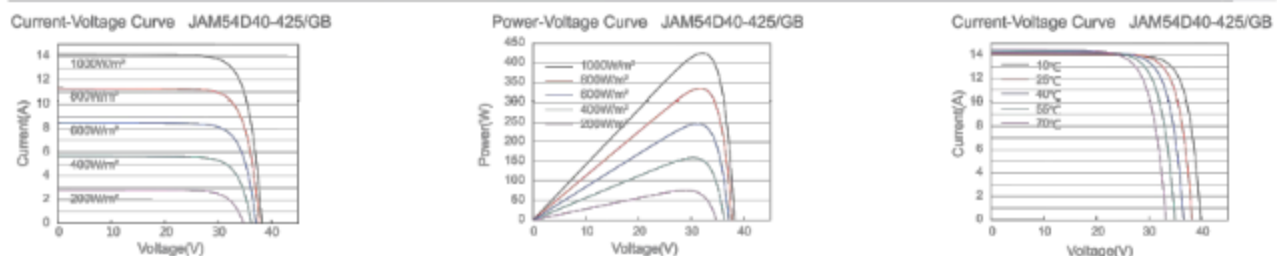
STC Irradiance 1000W/m², cell temperature 25°C, AM1.5G

Remark: Electrical data in this catalog do not refer to a single module and they are not part of the offer. They only serve for comparison among different module types.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO

TYPE	JAM54D40 -410/GB	JAM54D40 -415/GB	JAM54D40 -420/GB	JAM54D40 -425/GB	JAM54D40 -430/GB	JAM54D40 -435/GB	OPERATING CONDITIONS
Rated Max Power (Pmax) [W]	443	448	454	459	464	470	Maximum System Voltage 1500V DC
Open Circuit Voltage (Voc) [V]	37.85	37.95	38.08	38.23	38.35	38.48	Operating Temperature -40°C~+85°C
Max Power Voltage (Vmpp) [V]	31.37	31.58	31.79	32.00	32.21	32.41	Maximum Series Fuse Rating 30A
Short Circuit Current (Isc) [A]	15.07	15.14	15.22	15.29	15.37	15.44	Maximum Static Load, Front 3600Pa(75 lb/ft ²) Maximum Static Load, Back 2400Pa(50 lb/ft ²)
Max Power Current (Imp) [A]	14.12	14.19	14.27	14.34	14.42	14.49	NOCT 45±2°C
Irradiation Ratio (rear/front)	10%						Bifaciality* 80%±10%
*Bifaciality=Pmax,rear/Rated Pmax,front							Fire Performance UL Type 29

CHARACTERISTICS



Premium Cells, Premium Modules

Version No.: Global_EN_20230105A

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PROJECT NUMBER
IE-032023-PV-003

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MSD CARLOW SOLAR PROJECT



CONSULTANT & CONTRACTOR



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18 OF 17

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ENGR. H.M

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DATE 12-07-2023
DWG NO. PV-016

CATALOGUE



Datasheet ValkPro+ | ValkPro+ East-West | ValkPro+ Max

The concept

- Mounting system for PV-panels on flat roofs (commercial and domestic).
- For south and east-west configurations.
- Fixed tilt angle of 10° (Landscape or Portrait).
- Low ballast, shielded system with wind deflectors (south).

ValkPro+ vs. competitive systems

- Most cost effective solution.
- All metal connections, no plastic. This ensures high strength and reliability and makes the system easy to ground and for equalization of potential.
- Also suitable for roofs higher than 25 mtrs.
- Can be placed with ballast only on flat roofs with a maximum slope up to 5°. On roofs with a bigger slope, the system needs to be fixed to the roof.
- Universal integrated panel clamps (28-50 mm frame height).
- Suitable to be placed on roofs with gravel, "green roofs" or fixed on steel structures above the roof.
- Elevated mounting on roof for guaranteed drainage.

Additional features

- Designed and calculated according to latest building regulations.
- Low ballast and roof load, thanks to the use of wind deflectors and coupled rows.
- Easy and fast installation, thanks to limited number of parts and screw joints.
- Maximum logistical advantage, thanks to limited number of different parts and dimensions.
- Smart solutions to hold cables and cable baskets.
- Easy to disassemble.

Panel formats

- ValkPro+ (south & east-west) is standard applicable for panels with the following dimensions:

Configurat	Panel length min [mm]	Panel length max [mm]*	Panel width min [mm]	Panel width max [mm]	Pitch [mm]
L10° South	1520	2320	977	1250	1500*
L10° East-West	1520	2320	977	1070	2300
			1121	1170	2500
P10° South	1559	2200	900	1500	2300*
	1560	1680	900	1500	3500
	1681	1730	900	1500	3600
	1731	1830	900	1500	3800
P10° East-West	1831	2035	900	1500	4200
	2036	2135	900	1500	4400
	2096	2500	900	1500	3000*
Max South	2096	2172	900	1500	4500
	2173	2268	900	1500	4700
	2269	2369	900	1500	4900
	2370	2471	900	1500	5100

* Other pitch sizes available on request. Please contact Van der Valk Solar Systems for possibilities.

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