Miron
Energy Efficiency

Contractors Proposal Technical Submittal Cover Sheet

Project:	19 – 37 Highgate Road	**T/S No.**	021	**Rev**	1
Contract No.		**Date:**	13/06/2024		
To:	M&E Consultant TR	**Issued By:**	Danu Miron		
CC:		**Signed:**			
Response Required by:	Within 1 week from issue date				
Technical Submittal Description:	PV level 5				

Please see the attached technical information for your comment and status

Response ✓	**A** **Contractor proposal accepted for Construction**	**B** **Accepted with comments incorporated**	**C** **Rejected / Not accepted for construction**

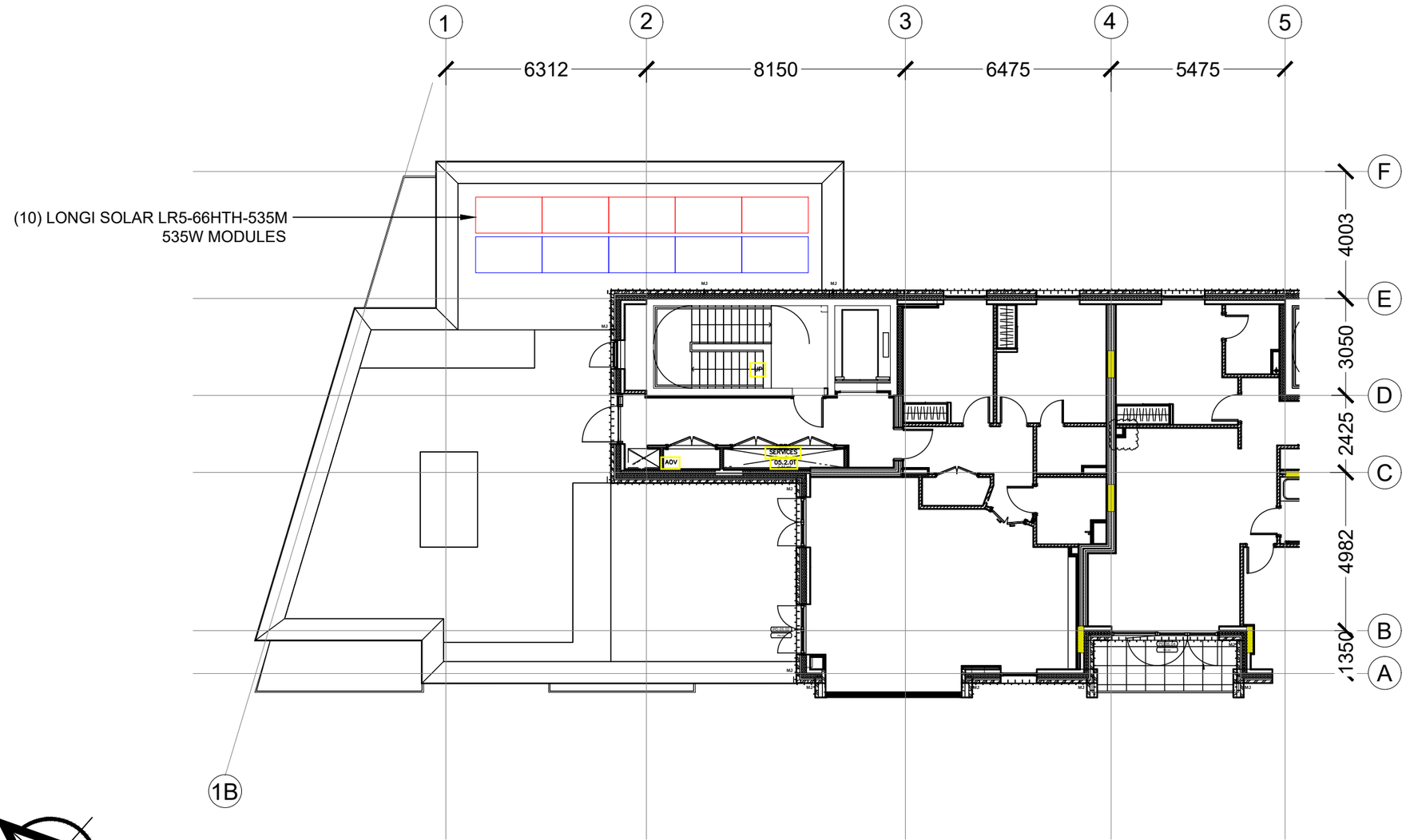
Comments:

Revision Comments:

Name		**Signed**	
Date	13/06/2024	**Copies**	

PROJECT DESCRIPTION:	
SYSTEM SIZE	5.35KW DC STC
MODULE TYPE	(10) LONGI SOLAR LR5-66HTH-535M 535W

INDEX SHEET	
A.00	SITE PLAN
A.01	LAYOUT PLAN
S.00	FRAMING DETAILS
D.00-D03	SPECIFICATION SHEETS



1 SITE PLAN
SCALE: 1:150

EG SOLAR
Renewable Energy Specialists

C6 SPECTRUM BUSINESS ESTATE
ANTHONYS WAY,
ROCHESTER, KENT
ME2 4NP

PRO.DATE	02/05/2023
DESIGN BY	DR
CHECKED BY	JD

PROJECT NAME

19 - 37 HIGHGATE ROAD
(LEVEL 05)

SHEET NAME

SITE PLAN

SHEET SIZE

ANSI B
279 X 432

SHEET NUMBER

A.00

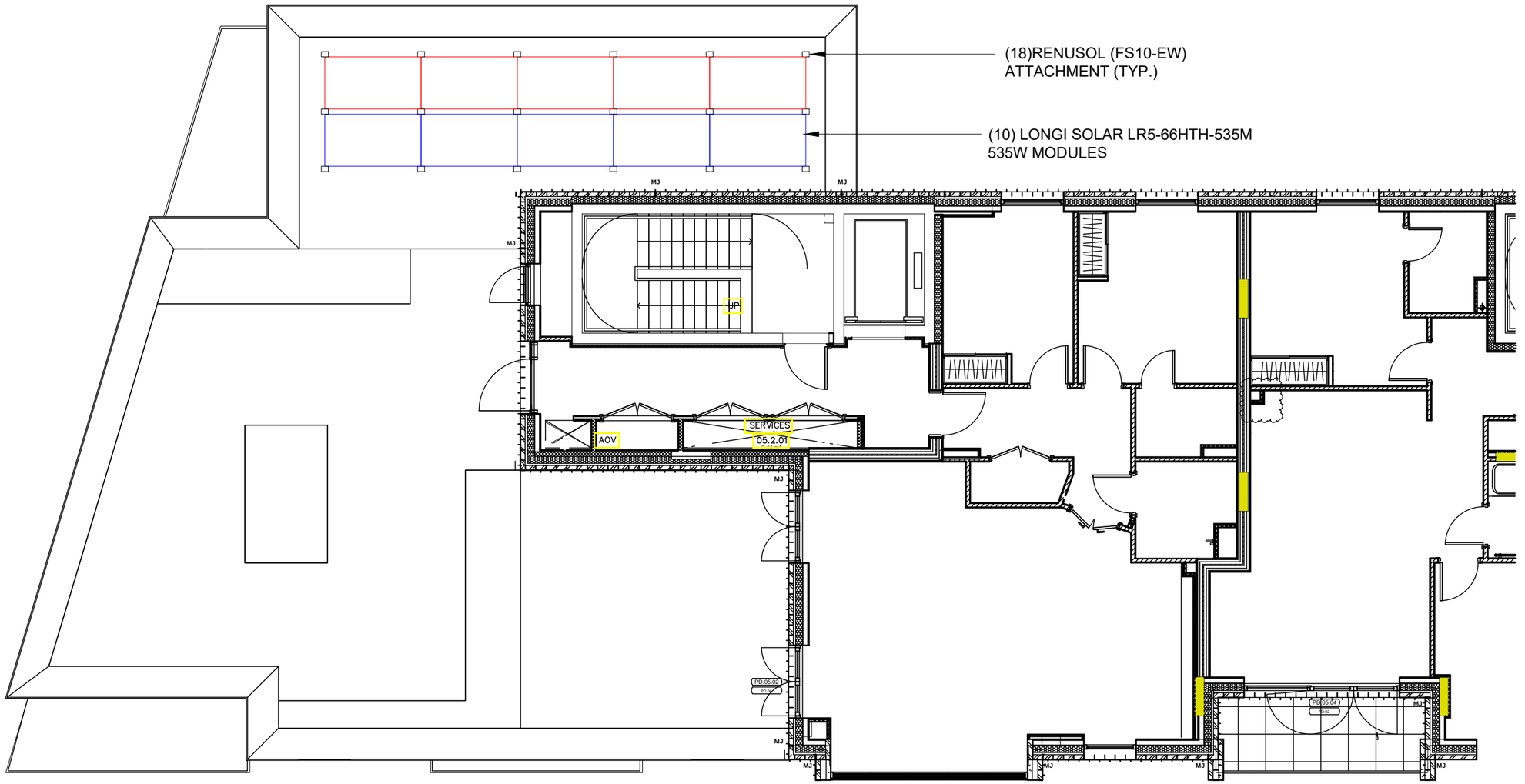
MODULES AREA & ROOF AREA CALC'S

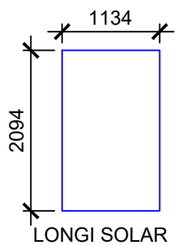
# OF MODULES	MODULES AREA (Sq. Meter)	ROOF AREA (Sq. Meter)	ROOF AREA COVERED BY MODULES (%)
10	23.70	44.79	52.91

LEGENDS

EAST FACING MODULE

WEST FACING MODULE





LONGI SOLAR
LR5-66HTH-535M
535W MODULE

1 LAYOUT PLAN

SCALE: 1:100

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LAYOUT PLAN

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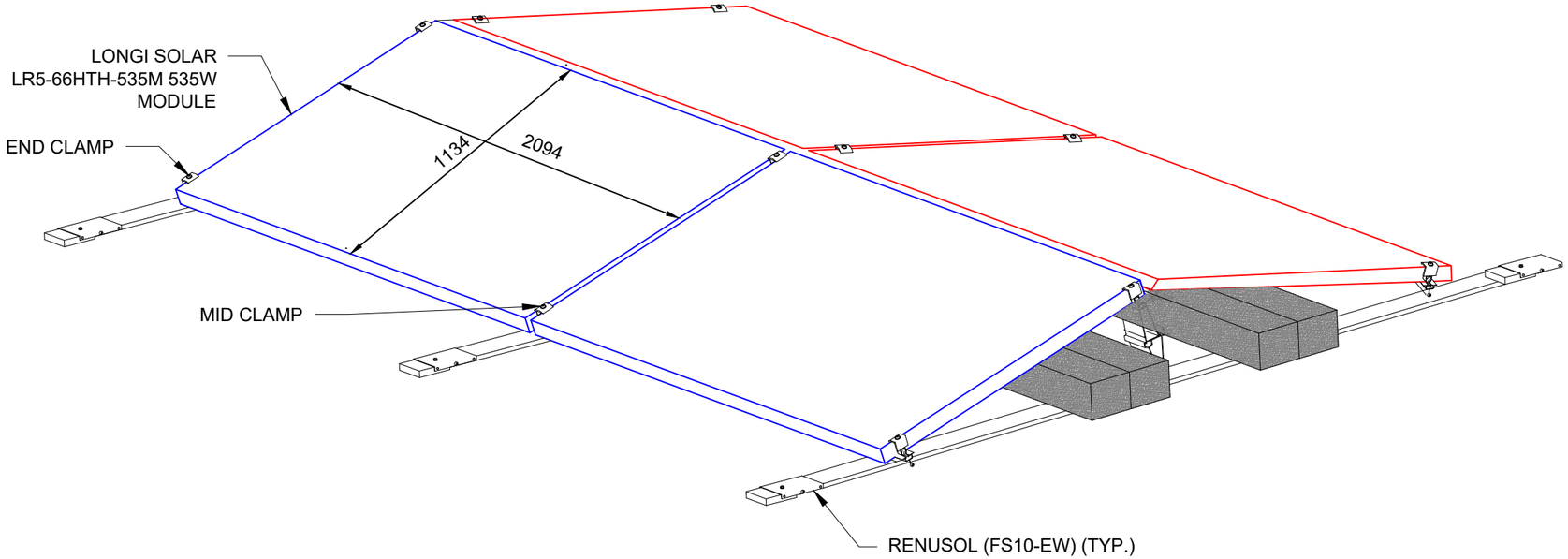
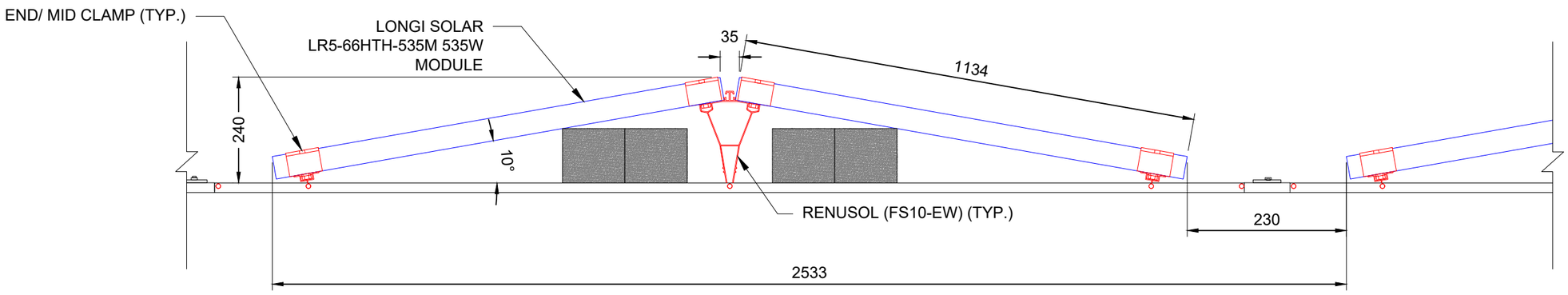


1 ISOMETRIC VIEW
SCALE: NTS



1 STRING PLAN
SCALE: NTS

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FRAMING
LAYOUT

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SHEET NUMBER
S.00

Hi-MO 6
Explorer

LR5-66HTH
520~540M

- Suitable for Distribution Market
- Simple design embodies modern style
- Better energy generation performance
- High-quality module guarantees long-term reliability

25 25-year Warranty for Materials and Processing

25 25-year Warranty for Extra Linear Power Output

Complete System and Product Certifications

IEC 61215, IEC 61730, UL 61730

ISO9001:2015: ISO Quality Management System

ISO14001: 2015: ISO Environment Management System

ISO45001: 2018: Occupational Health and Safety

IEC62941: Guideline for module design qualification and type approval

LONGi

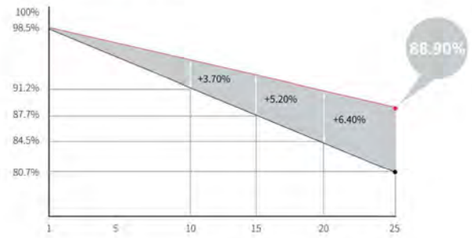
Hi-MO 6

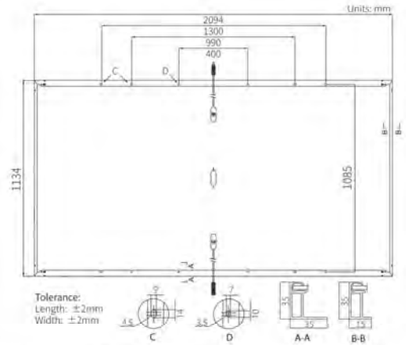
LR5-66HTH 520~540M

22.7%	0~3%	<1.5%	0.40%
MAX MODULE EFFICIENCY	POWER TOLERANCE	FIRST YEAR POWER DEGRADATION	YEAR 2-25 POWER DEGRADATION

Additional Value

25-Year Power Warranty





Mechanical Parameters

Cell Orientation	132 (6×22)
Junction Box	IP68, three diodes
Output Cable	4mm², ±1400mm length can be customized
Connector	EVO2
Glass	Single glass, 3.2mm coated tempered glass
Frame	Anodized aluminum alloy frame
Weight	26.0kg
Dimension	2094×1134×35mm
Packaging	31pcs per pallet / 155pcs per 20' GP / 682pcs per 40' HC

Electrical Characteristics

STC : AM1.5 1000W/m² 25°C NOCT : AM1.5 800W/m² 20°C 1m/s

Test uncertainty for Pmax: ≤3%

Module Type	LR5-66HTH-520M		LR5-66HTH-525M		LR5-66HTH-530M		LR5-66HTH-535M		LR5-66HTH-540M	
Testing Condition	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax/W)	520	388.6	525	392.3	530	396.0	535	399.8	540	403.5
Open Circuit Voltage (Voc/V)	47.58	44.68	47.73	44.82	47.88	44.96	48.03	45.10	48.18	45.24
Short Circuit Current (Isc/A)	14.05	11.35	14.12	11.41	14.20	11.47	14.28	11.53	14.36	11.59
Voltage at Maximum Power (Vmp/V)	39.91	36.42	40.06	36.55	40.22	36.70	40.38	36.85	40.53	36.99
Current at Maximum Power (Imp/A)	13.03	10.68	13.11	10.74	13.18	10.80	13.25	10.86	13.33	10.92
Module Efficiency(%)	21.9		22.1		22.3		22.5		22.7	

Operating Parameters

Operational Temperature	-40°C ~ +85°C
Power Output Tolerance	0 ~ 3%
Voc and Isc Tolerance	±3%
Maximum System Voltage	DC1500V (IEC/UL)
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	UL type 1 or 2 IEC Class C

Mechanical Loading

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

Temperature Ratings (STC)

Temperature Coefficient of Isc	+0.050%/°C
Temperature Coefficient of Voc	-0.230%/°C
Temperature Coefficient of Pmax	-0.290%/°C

LONGi

No.8369 Shangyuan Road, Xi'an Economic And Technological Development Zone, Xi'an, Shaanxi, China.

Web: www.longi.com

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PROJECT NAME

19 - 37 HIGHGATE ROAD (LEVEL 05)

SHEET NAME

SPECIFICATION SHEET

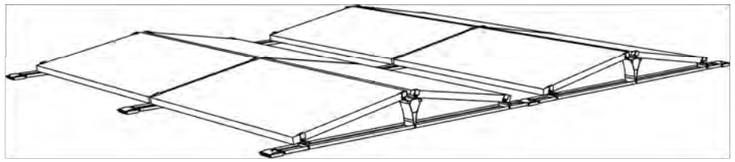
SHEET SIZE

ANSI B
279 X 432

SHEET NUMBER

D.00

Renusol Europe GmbH



System Datasheet

FS10-EW / FS10-EW XL

General

System	Ballasted PV-mounting system
Content	Ground rails, rail connector, building protection mat, low post, high post, clamps
System warranty	10 years
Application area	Flat roof on industrial, agricultural (except hydrogen sulfide exposition) and residential buildings
Roof covering	Bitumen, concrete, foil, gravel
Roof slope	max. 5° without additional measures

System properties

System orientation	East-West
Module tilt	10°
System weight approx.	1,15 kg/m²plus ballast (project specific)
Weight PV-module included approx.:	11,8 kg/m²plus ballast (project specific)
Friction coefficient	μ =0,5 is to be determined and ensured upon installation surface.
Material	Aluminum, stainless steel, rubber granulate
Minimum edge distance	0,6 m
Max. Wind Dynamic Pressure	q_p=1,5 kN/m² (with simultaneously acting snow load of s_k=1,5 kN/m²)
Max. Wind Dynamic Pressure	q_p=1,0 kN/m² (with simultaneously acting snow load of s_k=2,5 kN/m²)

Modules

Type	Suitable for standard 60/72 cell panels. Approval for panel corner clamping is to be obtained.
Module width:	FS10-EW: 950-1.052 mm / FS10-EW XL: 1053-1.168 mm
Module guidance	Horizontal/Landscape

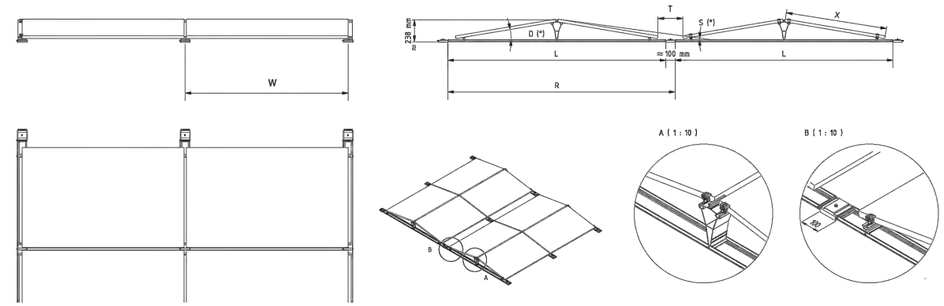
Certifications

Wind loads	Determined in wind tunnel tests by Ruscheweyh Consult GmbH
PV layout	Provided by Renusol (www.pv-configurator.com)
Ballast plan	Provided by Renusol (www.pv-configurator.com)

Services

PV layout	Provided by Renusol (www.pv-configurator.com)
Ballast plan	Provided by Renusol (www.pv-configurator.com)

Renusol Europe GmbH



System	FS10-EW XL	
Ground rail	R500499	
Rail length	L:	2362 mm
Row spacing	R:	2462 mm
Module width	X_1:	Min: 1053 mm
	X_2:	Max: 1168 mm
Passageway	$T(X_1)$:	Min: 355 mm
	$T(X_2)$:	Max: 125 mm
System width	W:	Module length +24mm
Module inclination	D:	9°
Shading angle	S:	≈ 7,0° - 9,0°

System	FS10-EW	
Ground rail	R500500	
Rail length	L:	2260 mm
Row spacing	R:	2360 mm
Module width	X_1:	Min: 950 mm
	X_2:	Max: 1052 mm
Passageway	$T(X_1)$:	Min: 455 mm
	$T(X_2)$:	Max: 255 mm
System width	W:	Module length +24mm
Module inclination	D:	10°
Shading angle	S:	≈ 6,7°-7,9°

System	FS10-EW	
Ground rail	R500407	
Rail length	L:	2060 mm
Row spacing	R:	2160 mm
Module width	X_1:	Min: 950 mm
	X_2:	Max: 1052 mm
Passageway	$T(X_1)$:	Min: 255 mm
	$T(X_2)$:	Max: 55 mm
System width	W:	Module length +24mm
Module inclination	D:	10°
Shading angle	S:	≈ 7,8° - 9,3°

System	FS10-EW	
Ground rail	R500501	
Rail length	L:	1989 mm
Row spacing	R:	2090 mm
Module width	X_1:	Min: 950 mm
	X_2:	Max: 1020 mm
Passageway	$T(X_1)$:	Min: 185 mm
	$T(X_2)$:	Max: 45 mm
System width	W:	Module length +24mm
Module inclination	D:	10°
Shading angle	S:	≈ 9,0° - 9,5°

FS10-EW 09 | 2021
EN | Renusol System Datasheet

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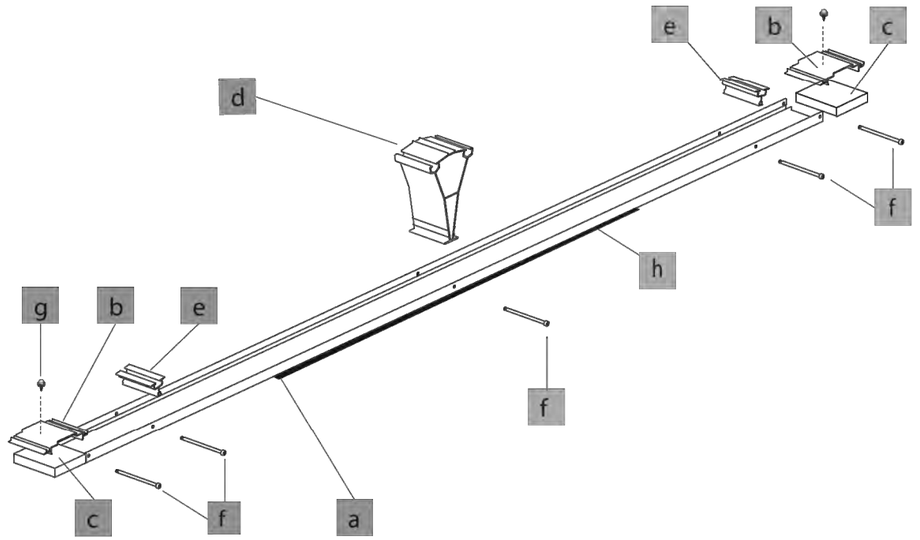
19 - 37 HIGHGATE ROAD
(LEVEL 05)

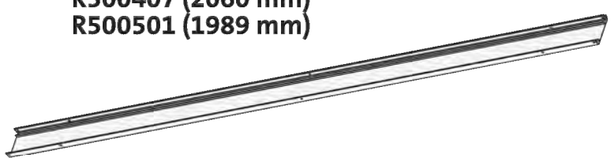
SHEET NAME
SPECIFICATION SHEET

SHEET SIZE
ANSI B
279 X 432

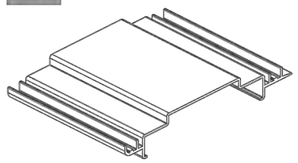
SHEET NUMBER
D.01



a R500499 (2362 mm) - FS10-EW XL
R500500 (2260 mm)
R500407 (2060 mm)
R500501 (1989 mm)



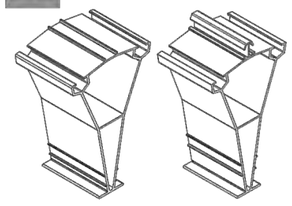
b R500404



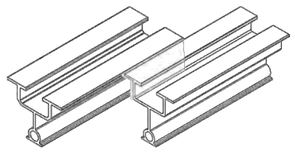
c R500410/R500411

R500410: Bituminöse Abdichtung /Bituminous sealing
R500411: Folienabdichtung / Foil sealing

d R500520 - FS10-EW
R500423 - FS10-EW XL

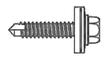


e R500420 - FS10-EW
R500419 - FS10-EW XL



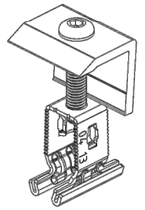
f R900314

g R900229



h R500412

R420081



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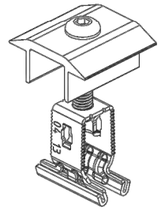
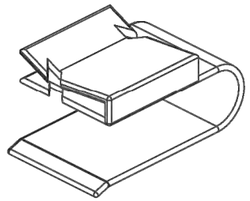


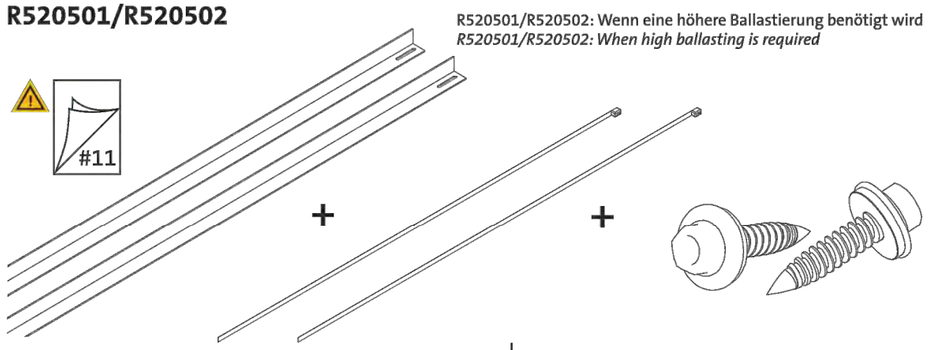
R900260 (optional)



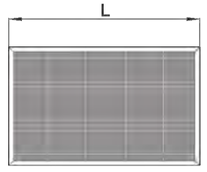
R900035 (optional)

R520501/R520502

R520501/R520502: Wenn eine höhere Ballastierung benötigt wird
R520501/R520502: When high ballasting is required



Modullänge L / *Modul length L*	Artikel No.
1770 mm	R520501
2120 mm	R520502



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19 - 37 HIGHGATE ROAD
(LEVEL 05)

SHEET NAME

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279 X 432

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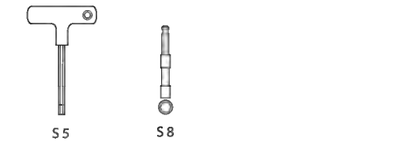
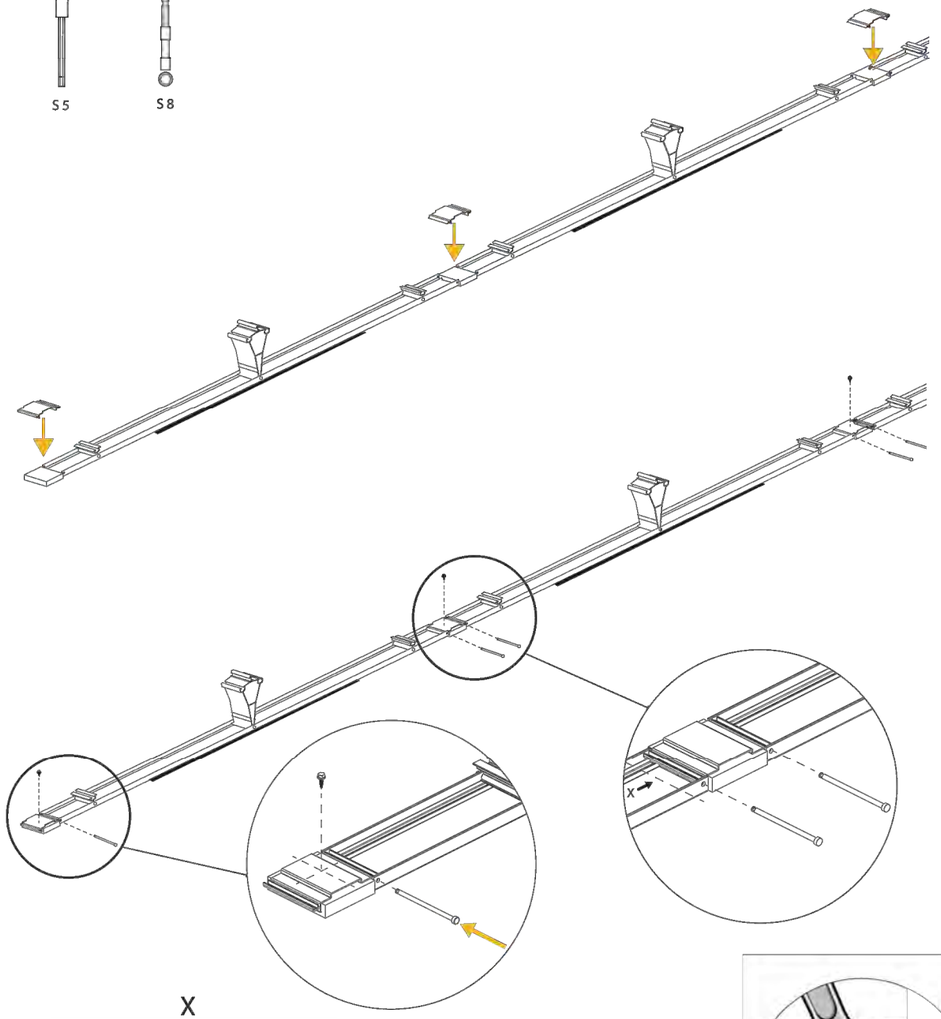
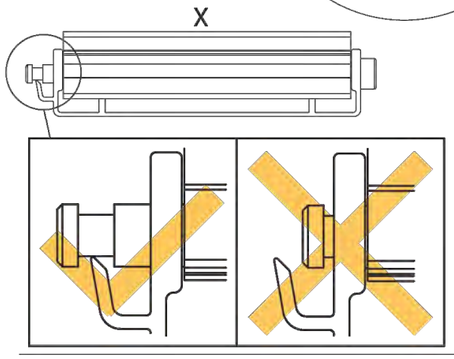
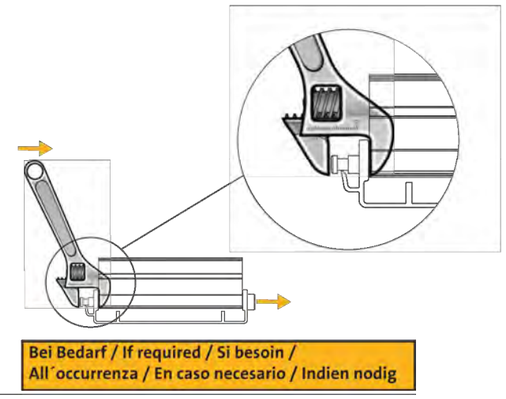
D.02

FS10-EW









FS10-EW

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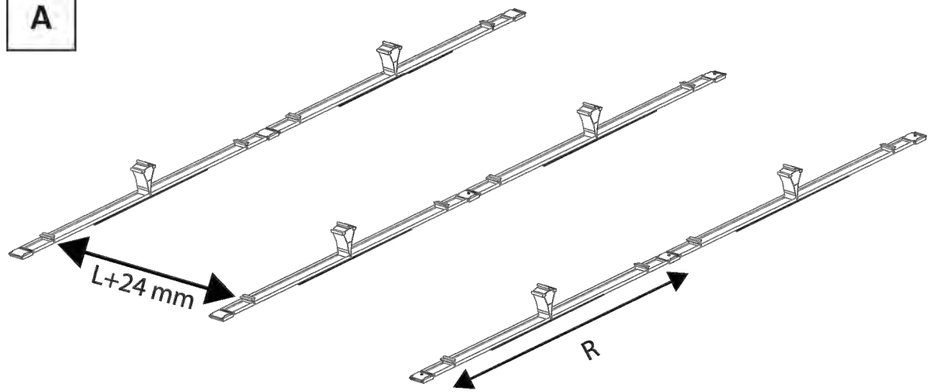
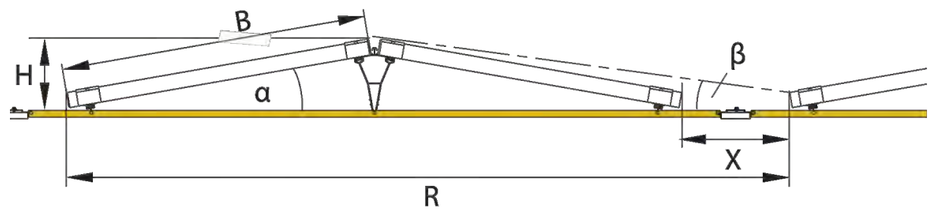
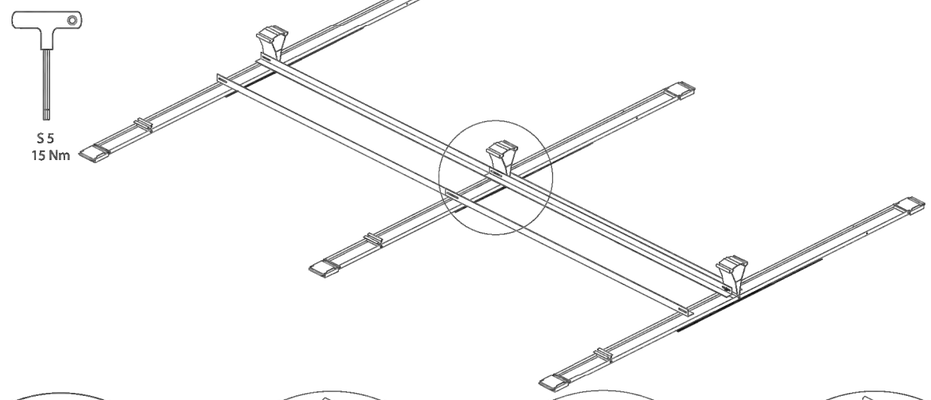
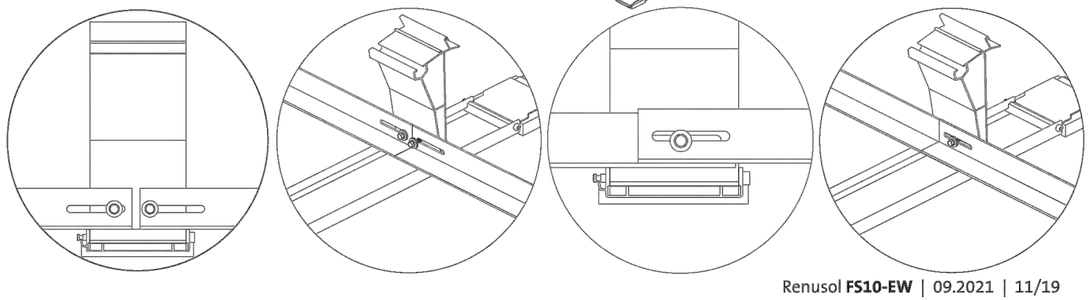




A.1 **R520501/R520502 (optional)**





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SPECIFICATION SHEET

SHEET SIZE

ANSI B
279 X 432

SHEET NUMBER

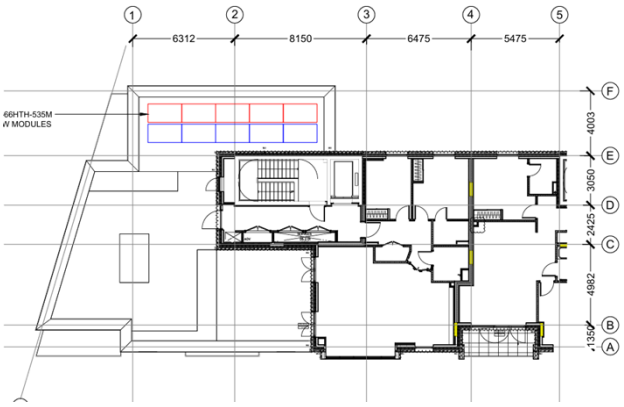
D.03

Project Name: highgate Level 5

12/06/2024

Your PV system

Address of Installation



Project Overview

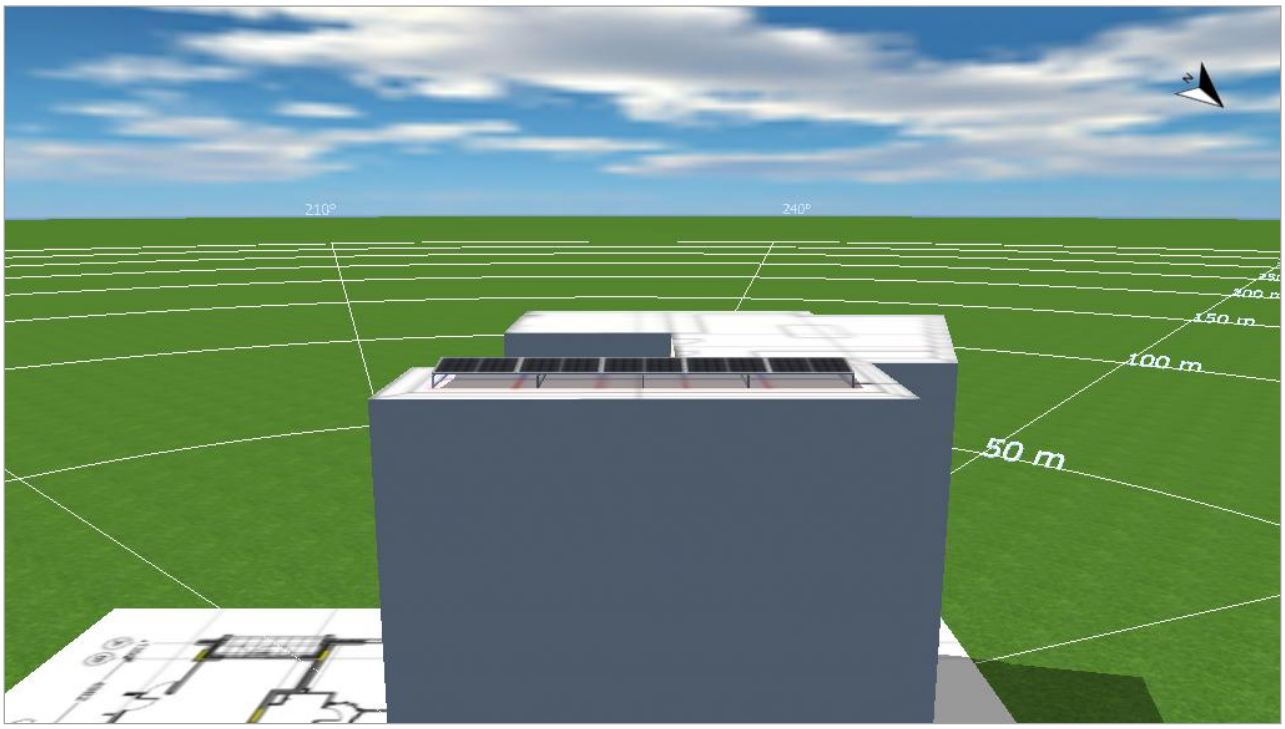


Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System

Climate Data	London Weather C., GBR (1986 - 2005)	
Values source	Meteonorm 7.1	
PV Generator Output	5.35	kWp
PV Generator Surface	23.7	m²
Number of PV Modules	10	
Number of Inverters	1	

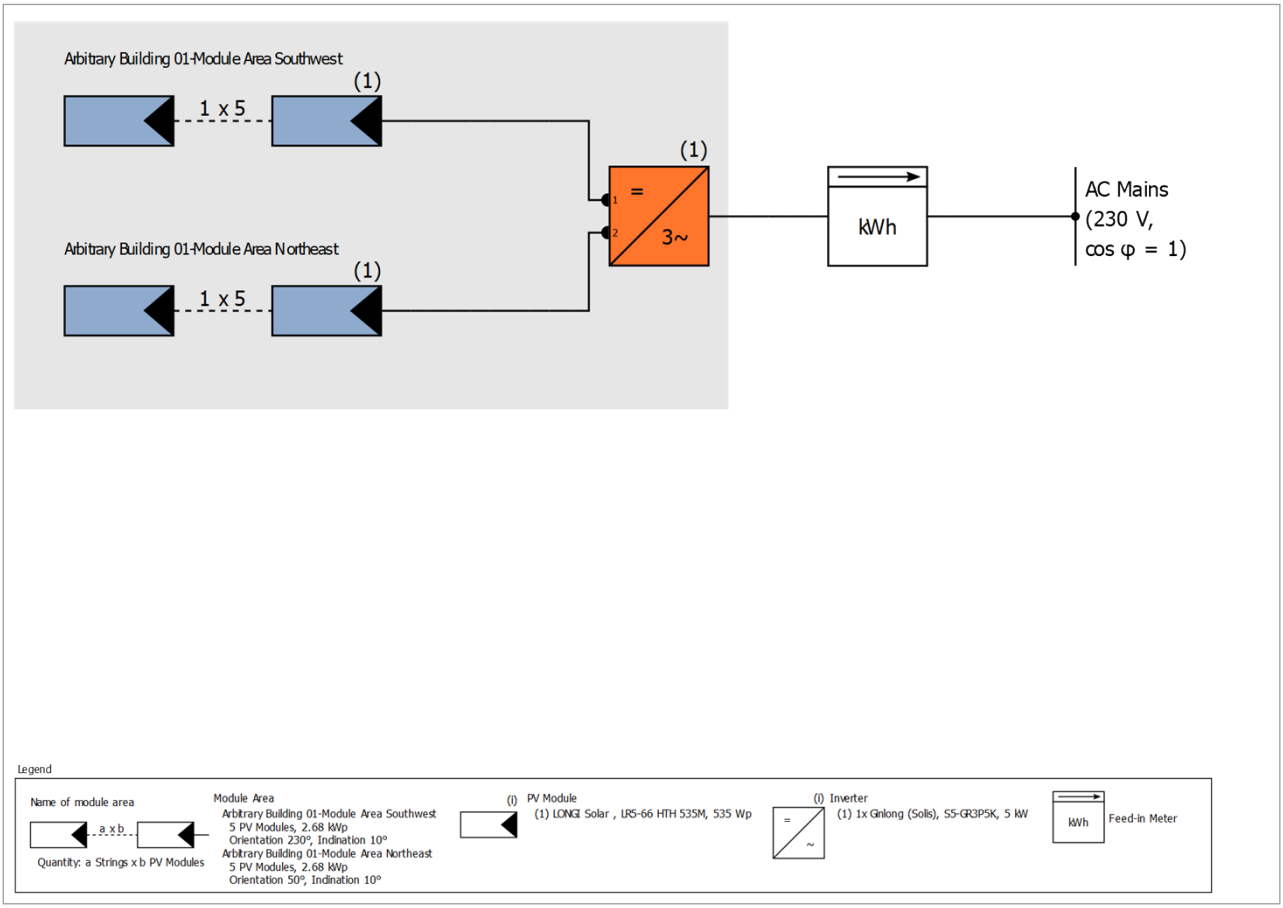


Figure: Schematic diagram

Production Forecast

Production Forecast		
PV Generator Output	5.35	kWp
Spec. Annual Yield	840.89	kWh/kWp
Performance Ratio (PR)	87.89	%
Yield Reduction due to Shading	Not calculated	
Grid Export	4,503	kWh/Year
Grid Export in the first year (incl. module degradation)	4,503	kWh/Year
Standby Consumption (Inverter)	4	kWh/Year
CO_2 Emissions avoided	2,114	kg / year

Financial Analysis

Your Gain		
Total investment costs	0.00	£
Internal Rate of Return (IRR)	267.81	%
Amortization Period	0.0	Years
Electricity Production Costs	0	£/kWh
Energy Balance/Feed-in Concept	Full Feed-in	

The results have been calculated with a mathematical model calculation from Valentin Software GmbH (PV*SOL algorithms). The actual yields from the solar power system may differ as a result of weather variations, the efficiency of the modules and inverter, and other factors.

Set-up of the System

Overview

System Data

Type of System	3D, Grid-connected PV System

Climate Data

Location	London Weather C., GBR (1986 - 2005)
Values source	Meteonorm 7.1
Resolution of the data	1 h
Simulation models used:	
- Diffuse Irradiation onto Horizontal Plane	Hofmann
- Irradiance onto tilted surface	Hay & Davies

Module Areas

1. Module Area - Arbitrary Building 01-Module Area Southwest

PV Generator, 1. Module Area - Arbitrary Building 01-Module Area Southwest

Name	Arbitrary Building 01-Module Area Southwest
PV Modules	5 x LR5-66 HTH 535M (v1)
Manufacturer	LONGI Solar
Inclination	10 °
Orientation	Southwest 230 °
Installation Type	Mounted - Roof
PV Generator Surface	11.9 m²

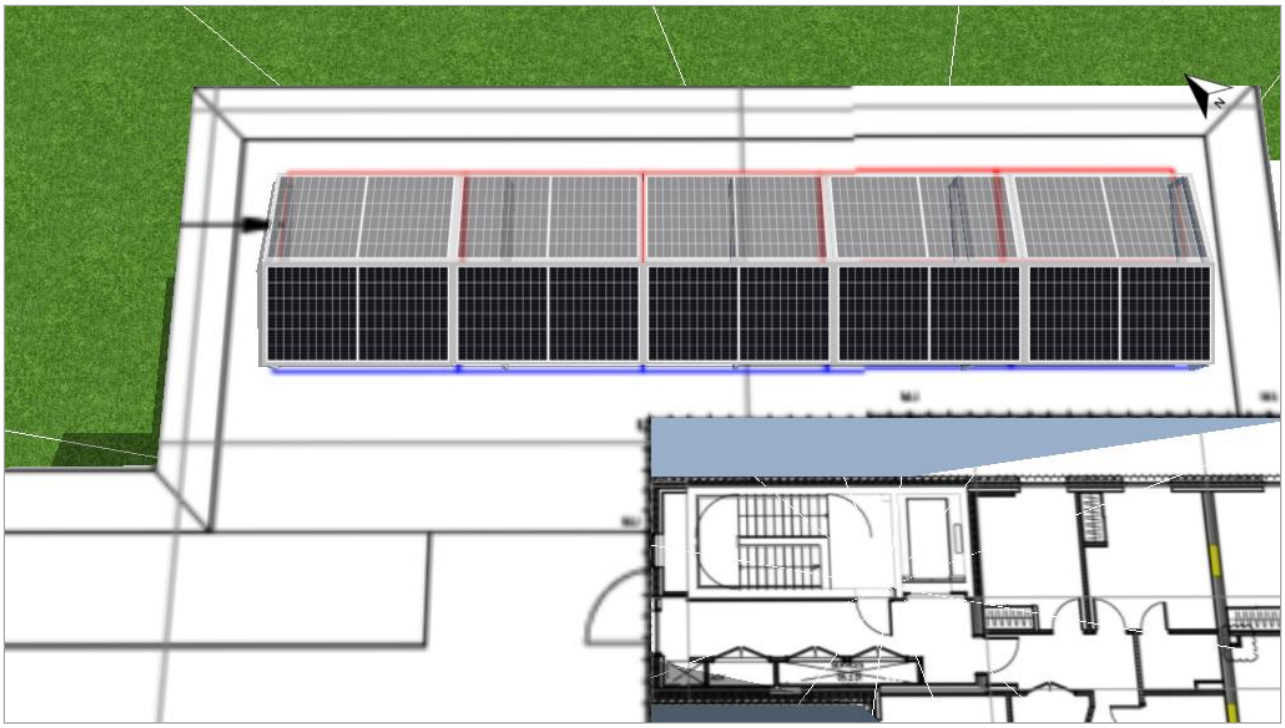


Figure: 1. Module Area - Arbitrary Building 01-Module Area Southwest

2. Module Area - Arbitrary Building 01-Module Area Northeast

PV Generator, 2. Module Area - Arbitrary Building 01-Module Area Northeast

Name	Arbitrary Building 01-Module Area Northeast
PV Modules	5 x LR5-66 HTH 535M (v1)
Manufacturer	LONGI Solar
Inclination	10 °
Orientation	Northeast 50 °
Installation Type	Mounted - Roof
PV Generator Surface	11.9 m²

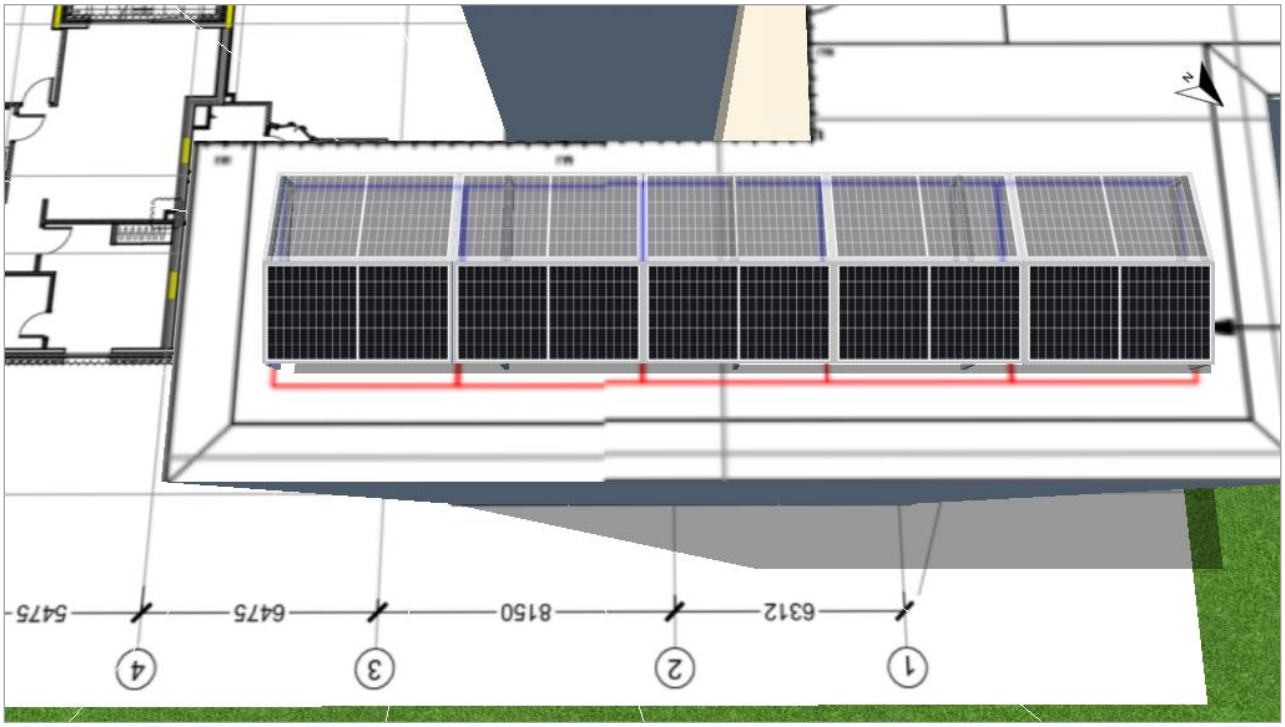


Figure: 2. Module Area - Arbitrary Building 01-Module Area Northeast

Horizon Line, 3D Design

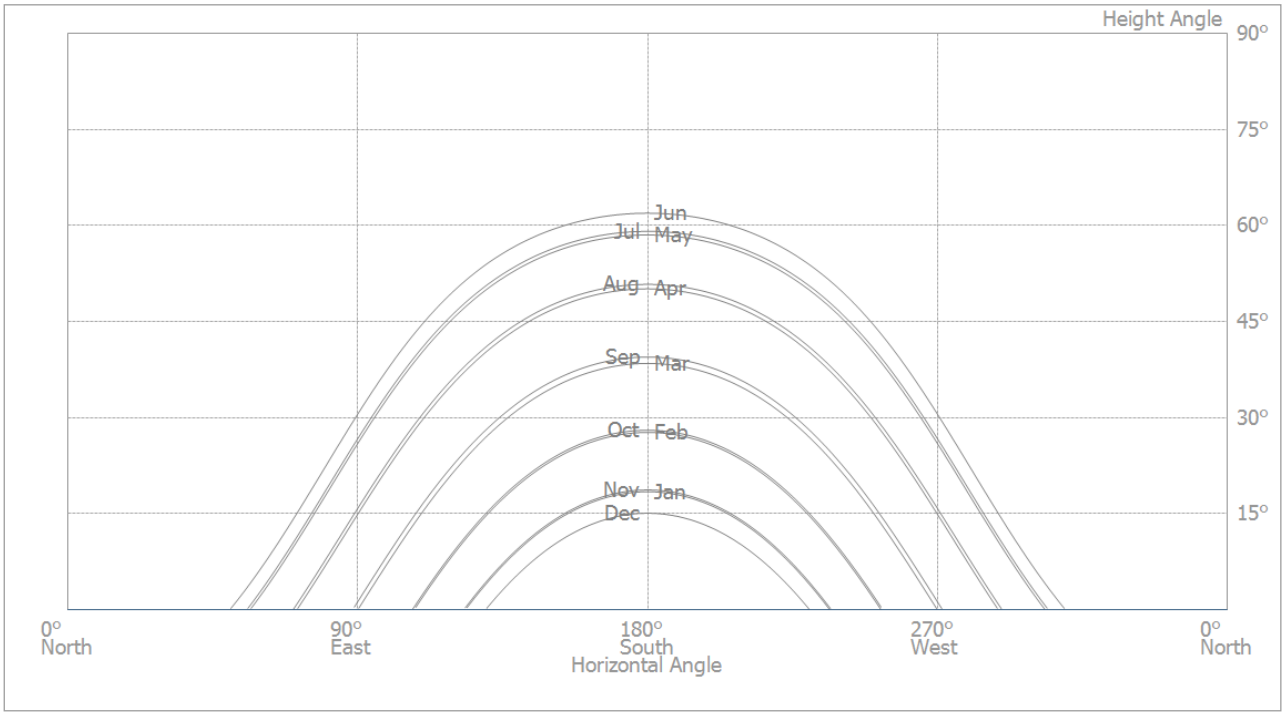


Figure: Horizon (3D Design)

Inverter configuration

Configuration 1	
Module Areas	Arbitrary Building 01-Module Area Southwest + Arbitrary Building 01-Module Area Northeast
Inverter 1	
Model	S5-GR3P5K (v2)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	107 %
Configuration	MPP 1: 1 x 5
	MPP 2: 1 x 5

AC Mains

AC Mains	
Number of Phases	3
Mains voltage between phase and neutral	230 V
Displacement Power Factor (cos phi)	+/- 1

Simulation Results

Results Total System

PV System		
PV Generator Output	5.35	kWp
Spec. Annual Yield	840.89	kWh/kWp
Performance Ratio (PR)	87.89	%
Yield Reduction due to Shading	Not calculated	
Grid Export	4,503	kWh/Year
Grid Export in the first year (incl. module degradation)	4,503	kWh/Year
Standby Consumption (Inverter)	4	kWh/Year
CO_2 Emissions avoided	2,114	kg / year

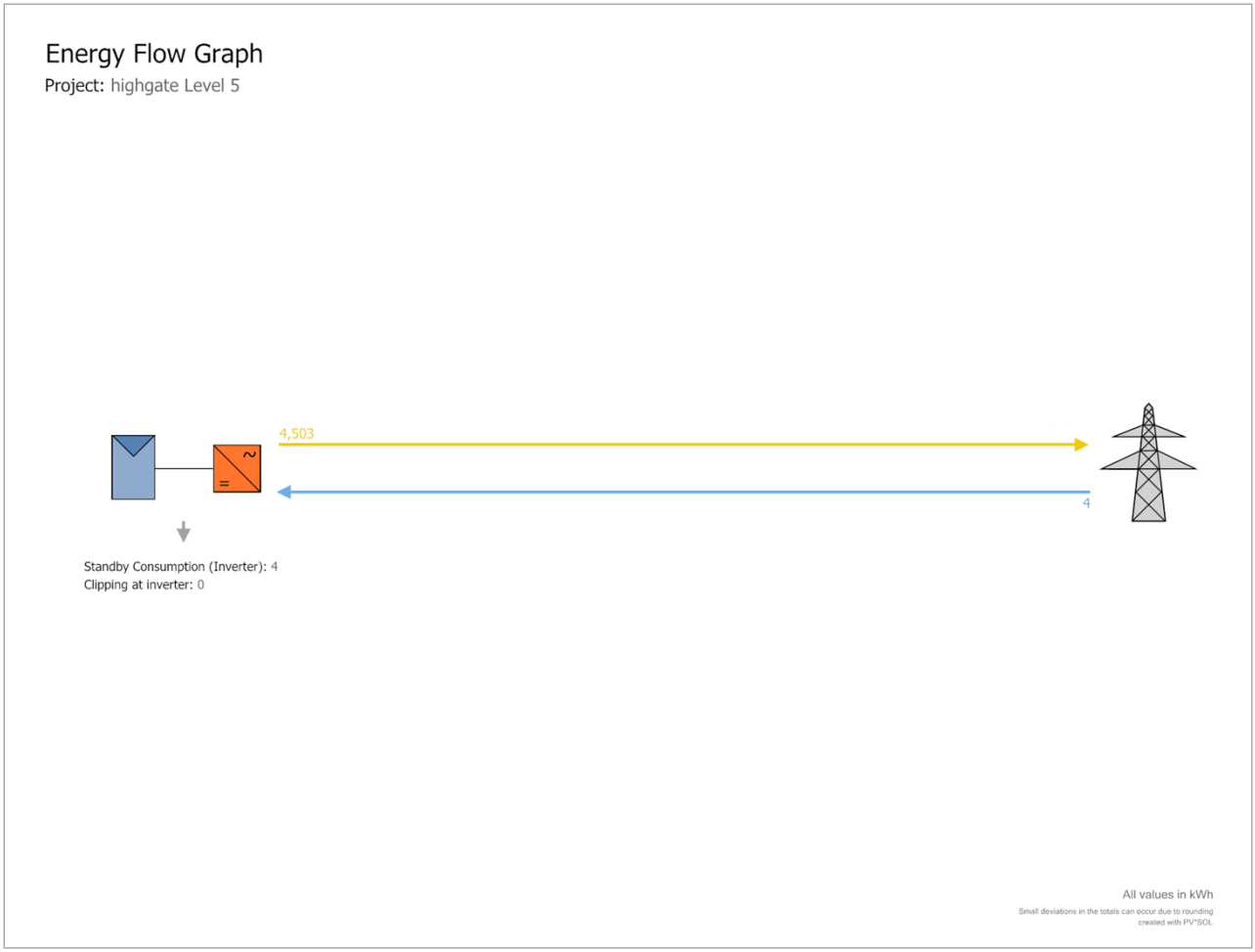


Figure: Energy flow

Plans and parts list

Circuit Diagram

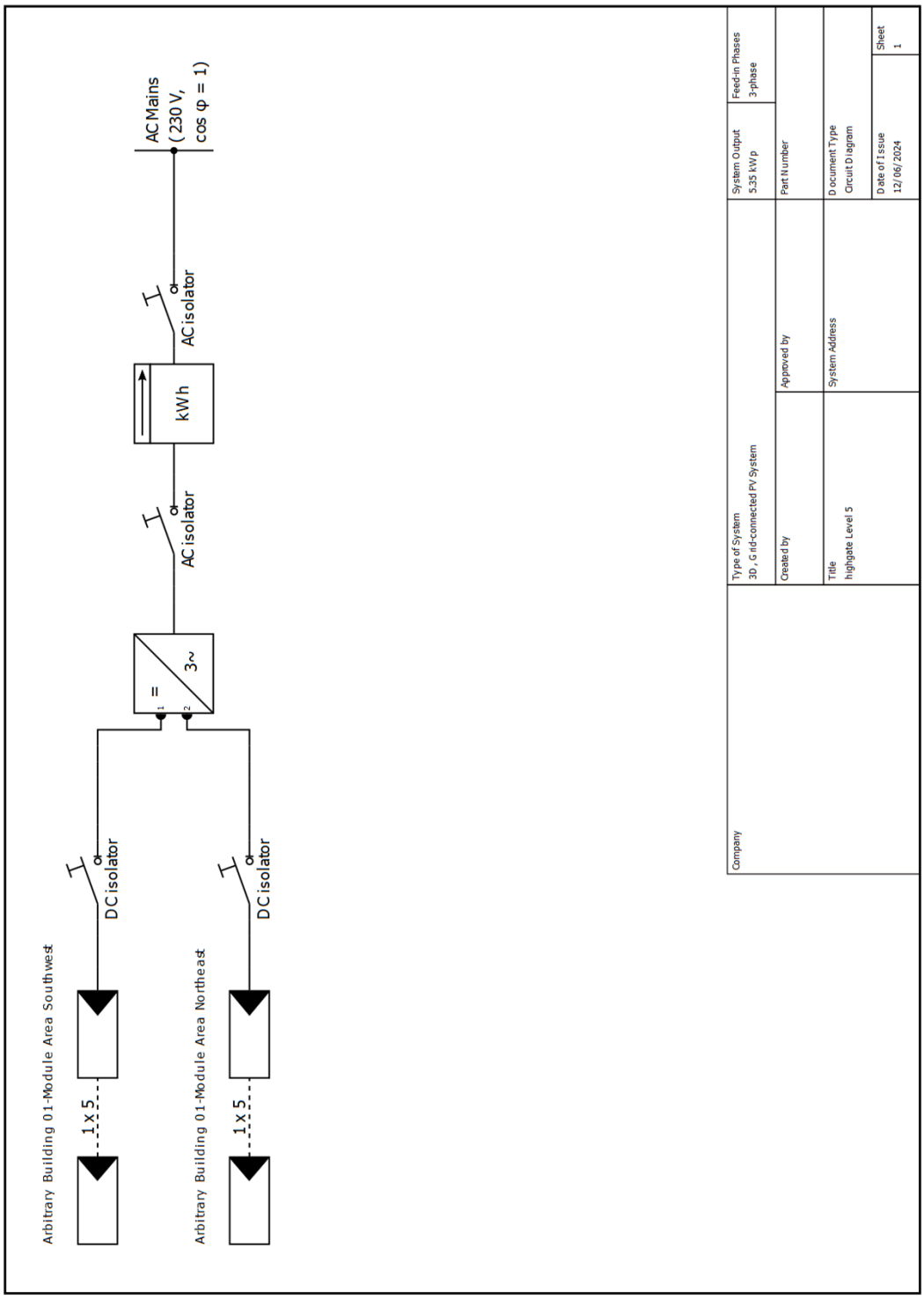


Figure: Circuit Diagram

Overview plan

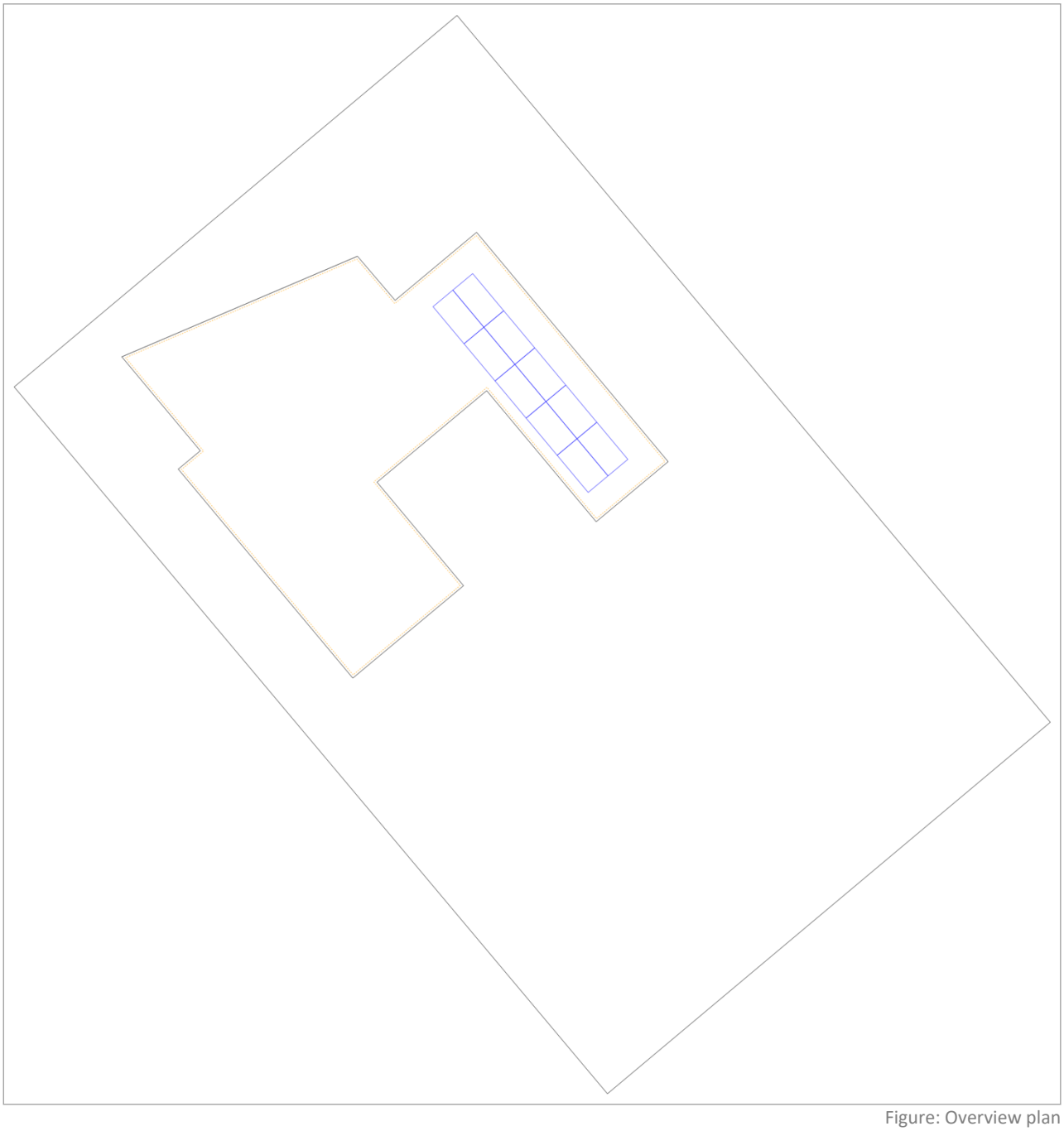


Figure: Overview plan

Dimensioning Plan

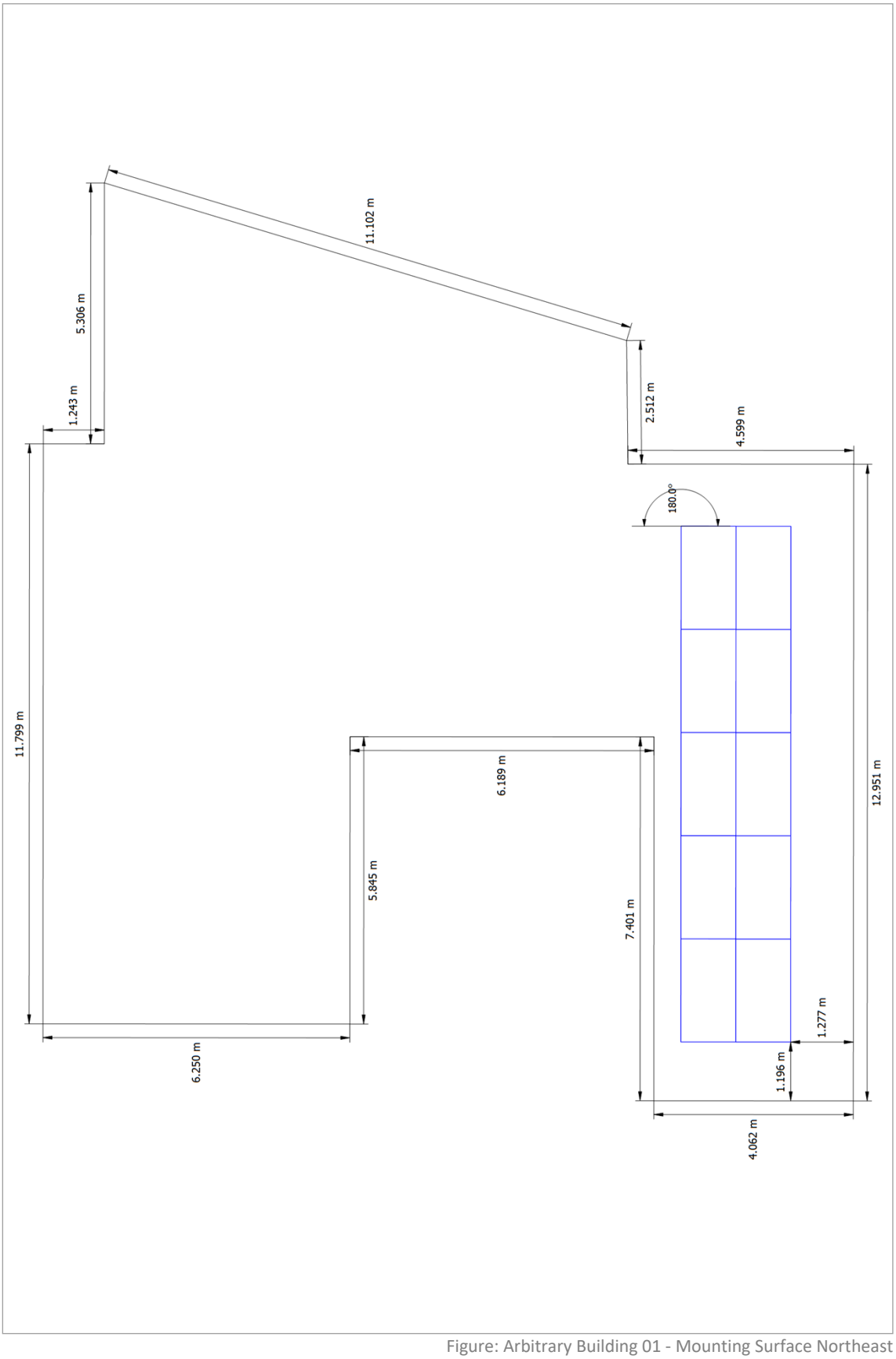


Figure: Arbitrary Building 01 - Mounting Surface Northeast

String Plan

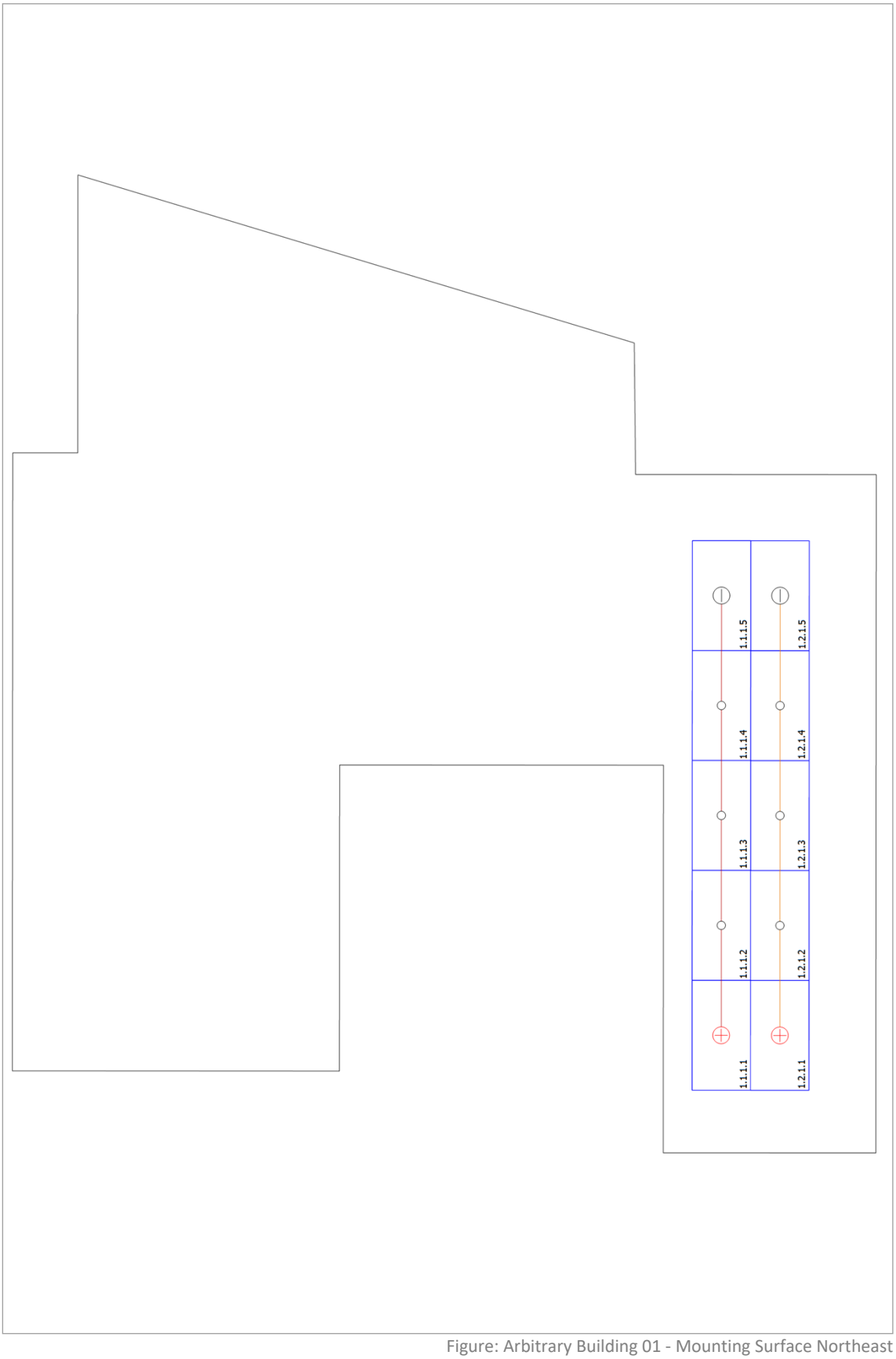


Figure: Arbitrary Building 01 - Mounting Surface Northeast

Parts list

Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		LONGI Solar	LR5-66 HTH 535M	10	Piece
2	Inverter		Ginlong (Solis)	S5-GR3P5K	1	Piece
3	Components			Feed-in Meter	1	Piece
4	Components			Load-break switch AC isolator	2	Piece
5	Components			Load-break switch DC isolator	2	Piece

solis

Solis Three Phase Inverters

» S5-GR3P(3-20)K

360 degree

Efficient

- Max. efficiency 98.7%
- String current up to **16A**
- Wide voltage range and low startup voltage

Safe

- IP66
- AFCI protection, proactively reduces fire risk
- Automatic voltage stabilization technology in weak grid conditions

Smart

- Supports export power control
- Supports RS485, WiFi, GPRS
- Scan to register on SolisCloud, supports remote upgrade and control

Economic

- Compact design, simple installation and maintenance
- > 150% DC/AC ratio
- Supports high power modules for lower installation costs

Model:

S5-GR3P3K S5-GR3P4K S5-GR3P5K S5-GR3P6K S5-GR3P8K S5-GR3P9K S5-GR3P10K
S5-GR3P12K S5-GR3P13K S5-GR3P15K S5-GR3P17K S5-GR3P20K

Datasheet

Model Name	S5-GR3P3K	S5-GR3P4K	S5-GR3P5K	S5-GR3P6K	S5-GR3P8K	S5-GR3P9K	S5-GR3P10K	S5-GR3P12K	S5-GR3P13K	S5-GR3P15K	S5-GR3P17K	S5-GR3P20K
Input DC												
Recommended max. PV power	4.5 kW	6 kW	7.5 kW	9 kW	12 kW	13.5 kW	15 kW	18 kW	19.5 kW	22.5 kW	25.5 kW	30 kW
Max. input voltage	1100 V											
Rated voltage	600 V											
Start-up voltage	180 V											
MPPT voltage range	160-1000 V											
Max. input current	16 A / 16 A							32 A / 32 A				
Max. short circuit current	20 A / 20 A							40 A / 40 A				
MPPT number/Max. input strings number	2/2							2/4				
Output AC												
Rated output power	3 kW	4 kW	5 kW	6 kW	8 kW	9 kW	10 kW	12 kW	13 kW	15 kW	17 kW	20 kW
Max. apparent output power	3.3 kVA	4.4 kVA	5.5 kVA	6.6 kVA	8.8 kVA	9.9 kVA	11 kVA	13.2 kVA	14.3 kVA	16.5 kVA	18.7 kVA	22 kVA
Max. output power	3.3 kW	4.4 kW	5.5 kW	6.6 kW	8.8 kW	9.9 kW	11 kW	13.2 kW	14.3 kW	16.5 kW	18.7 kW	22 kW
Rated grid voltage	3/N/PE, 220 V / 380 V, 230 V / 400 V											
Rated grid frequency	50 Hz / 60 Hz											
Rated grid output current	4.6 A / 4.3 A	6.1 A / 5.8 A	7.6 A / 7.2 A	9.1 A / 8.7 A	12.2 A / 11.5 A	13.7 A / 13.0 A	15.2 A / 14.4 A	18.2 A / 17.3 A	19.8 A / 18.8 A	22.8 A / 21.7 A	25.8 A / 24.6 A	30.4 A / 28.9 A
Max. output current	4.7 A	6.4 A	7.9 A	9.5 A	12.7 A	14.3 A	15.9 A	19.1 A	20.7 A	23.8 A	27 A	31.8 A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)											
THDi	<2%											
Efficiency												
Max. efficiency	98.3%				98.5%			98.6%			98.7%	
EU efficiency	97.7%				97.9%			98.0%			98.1%	
Protection												
DC reverse-polarity protection	Yes											
Short circuit protection	Yes											
Output over current protection	Yes											
Surge protection	Yes											
Grid monitoring	Yes											
Anti-islanding protection	Yes											
Temperature protection	Yes											
Integrated AFCI (DC arc-fault circuit protection)	Yes (1)											
Integrated DC switch	Optional											
General Data												
Dimensions (W*H*D)	310*563*219 mm											
Weight	17.8 kg								18.8 kg		20 kg	
Topology	Transformerless											
Self consumption (night)	<1 W											
Operating ambient temperature range	-25 ~ +60°C											
Relative humidity	0-100%											
Ingress protection	IP66											
Cooling concept	Natural convection							Intelligent redundant fan-cooling				
Max. operation altitude	4000 m											
Grid connection standard	G98 or G99, VDE-AR-N 4105 / VDE V 0124, EN 50549-1, VDE 0126 / UTE C 15 / VFR:2019, RD 1699 / RD 244 / UNE 206006 / UNE 206007-1, CEI 0-21, C10/11, NRS 097-2-1, TOR, EIFS 2018.2, IEC 62116, IEC 61727, IEC 60068, IEC 61683, EN 50530											
Safety/EMC standard	IEC/EN 62109-1/-2, IEC/EN 61000-6-1/-2/-3/-4											
Features												
DC connection	MC4 connector											
AC connection	Quick connection plug											
Display	LCD											
Communication	RS485, Optional: Wi-Fi, GPRS											

(1) Activation required.