

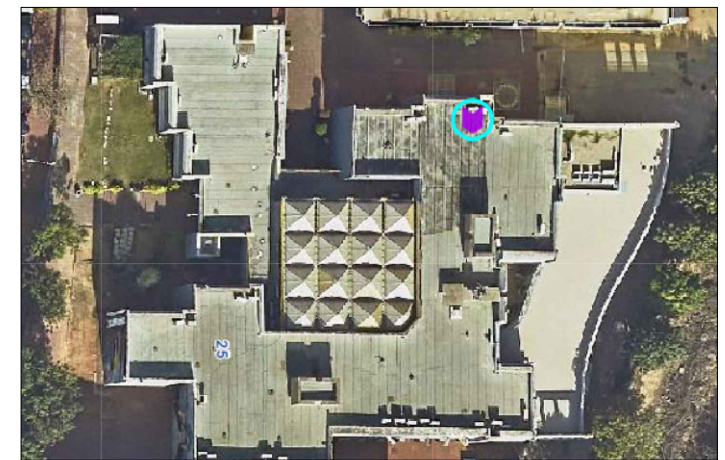
רמת גן – בית ספר ערמונים

מערכת סולארית מתח נמוך – 96.66Kw



רשימת תוכניות:

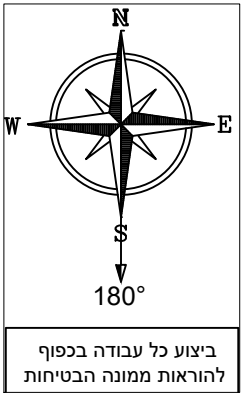
- Armonim School - G001 – הצבת פאנלים
- Armonim School - G002 – חיווט פאנלים
- Armonim School - B001 – קונסטרוקציה
- Armonim School - E001 – חד קווי
- Armonim School - C001 – סימולציה PVSyst
- Armonim School - C003 – חישוב הפסדי הולכה DC
- Armonim School - C004 – חישוב הפסדי הולכה AC

[illegible]

בית ספר ערמונים, רמת גן - חלוקה לסטרינגים/ממירים					540	הספק פאנל בודד(W)				
					179	מ"ס פאנלים כלל :				
					96.66	הספק כליל AC (kW) :				
					96.66	הספק כליל DC (KW) :				
					100.00%	יחס AC/DC :				
AC/DC	(kW) AC	הספק DC	מ"ס פאנלים	אופטימיזציה P1100	מ"ס סטרינגים	mppt	כניסת mmpt	סוג ממיר (kW)	ממיר	גג
100.00%	96.66	96.66	30	15	2	Right	SE 100kW [96.66kW]	1	בטון	
			29	15						
			30	15	2	Center				
			30	15						
			30	15	2	Left				
30	15									
100.00%	96.66	96.66	179	90						הנ"כ כמות:

Title: תוכנית הצבת פאנלים		DRAWING NUMBER: Armonim school - G001				REV		DATE		DRAWN		COMMENTS		Panels		Inverters		Quant'								
Client: שחר אנרגיה		Site location: רמת גן		DATE: 30/8/21	Scale: ###	Print size: A3	Sheet : 1/1	A 1	14/07/21	Roi N.	Layout Update		Manuf:'	Chint [2256x1133x35]		Manuf:'	Solar Edge									
														Model:	540W		Model A:	100kW [96.66kW]		1						
																Quant:'	179		Model B:							
																		Tilt:	15°		Model C:					
																		Azimuth:		180°		Model D:				
																				T.Power:	96.66kWp		T.Power:	96.66kW		
Designer: Roi Nakash				APPROVAL / STAMP																						
Approved:																										
STATUS : לאישור		REV: A 1																								

Armonim StringWiring



ביצוע כל עבודה בכפוף להוראות ממונה הבטיחות

מקרא חיווט:

XX - YY - ZZ

XX - מספר ממיר

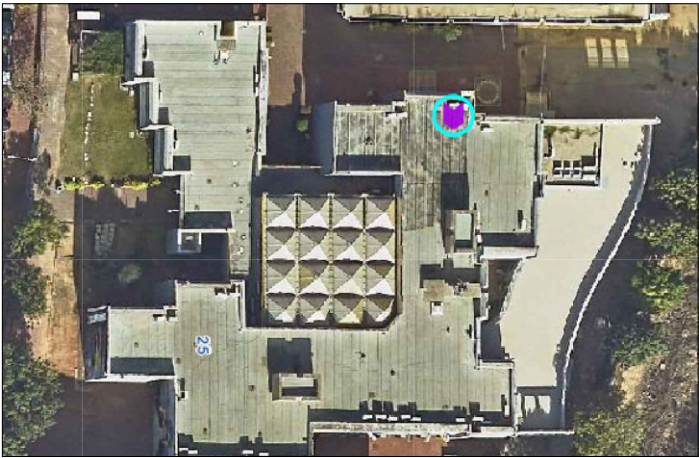
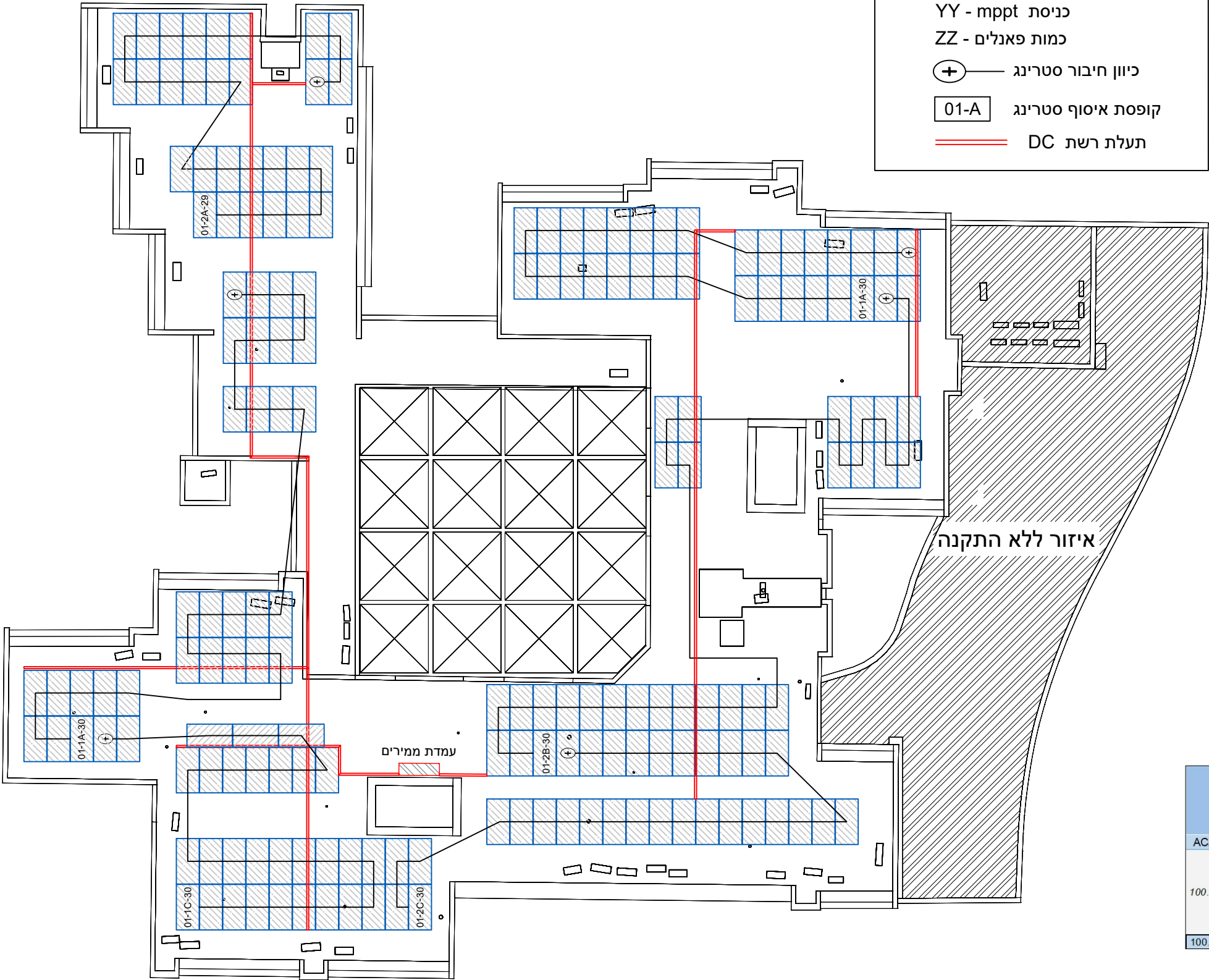
YY - mppt כניסת

ZZ - כמות פאנלים

⊕ — כיוון חיבור סטרינג

01-A קופסת איסוף סטרינג

== תעלת רשת DC

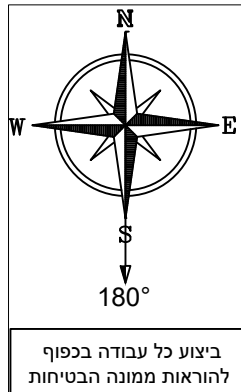


בית ספר ערמונים, רמת גן - חלוקה לסטרינגים/ממירים							הספק פאנל בודד (W)
							179
							96.66
							96.66
							100.00%
AC/DC	(kW) AC	הספק (kW) DC	מ"ס פאנלים	אפטימיזרים P1100	מ"ס סטרינגים	כניסת mppt	סוג ממיר (kW)
100.00%	96.66	96.66	30	15	2	Right	SE 100kW [96.66kW]
			29	15			
			30	15	2	Center	
			30	15			
			30	15	2	Left	
100.00%	96.66	96.66	179	90			
							סה"כ כמות:

Title: תוכנית חיווט פאנלים		DRAWING NUMBER: Armonim school - G002				REV				DATE				DRAWN				COMMENTS				Panels		Inverters		Quant'
Client: שחר אנרגיה		Site location: רמת גן		DATE: 30/8/21	Scale: ####	Print size: A3	Sheet : 1/1		A 1	14/07/21	Roi N.	Layout Update				Manuf.:	Chint [2256x1133x35]		Manuf.:	Solar Edge						
		Designer: Roi Nakash				APPROVAL / STAMP								Model:	540W		Model A:	100kW [96.66kW]		1						
		Approved:												Quant.:	179		Model B:									
		STATUS : לאישור								REV: A 1				Model C:	15°		Model D:									
														Azimuth:	180°		Model D:									
														T.Power:	96.66kWp		T.Power:	96.66kW								



Armonim Construction

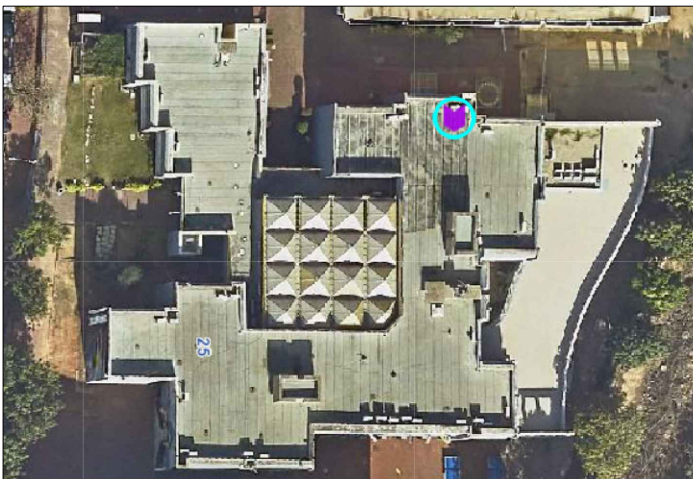


ביצוע כל עבודה בכפוף
להוראות ממונה הבטיחות

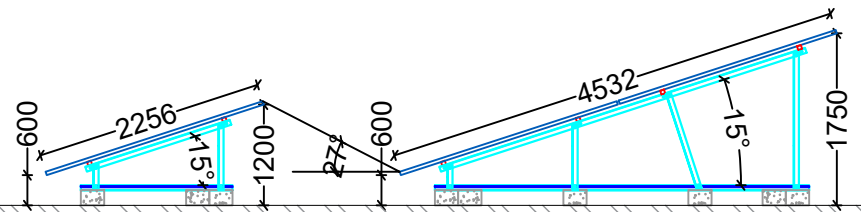
כתב כמויות - רגליים ערמונים

כמות	תיאור	פרט
3	גובה מהרצפה: 600 מ"מ זווית: 12°	פאנל בודד
15	גובה מהרצפה: 600 מ"מ זווית: 12°	פאנל כפול
10	גובה מהרצפה: 600 מ"מ זווית: 15°	פאנל בודד
42	גובה מהרצפה: 600 מ"מ זווית: 15°	פאנל כפול
4	גובה מהרצפה: 600 מ"מ זווית: 15°	פאנל בודד וחצי
72	אורך 2.3 מ	דאגונל
452	39 ק"ג	אבנים

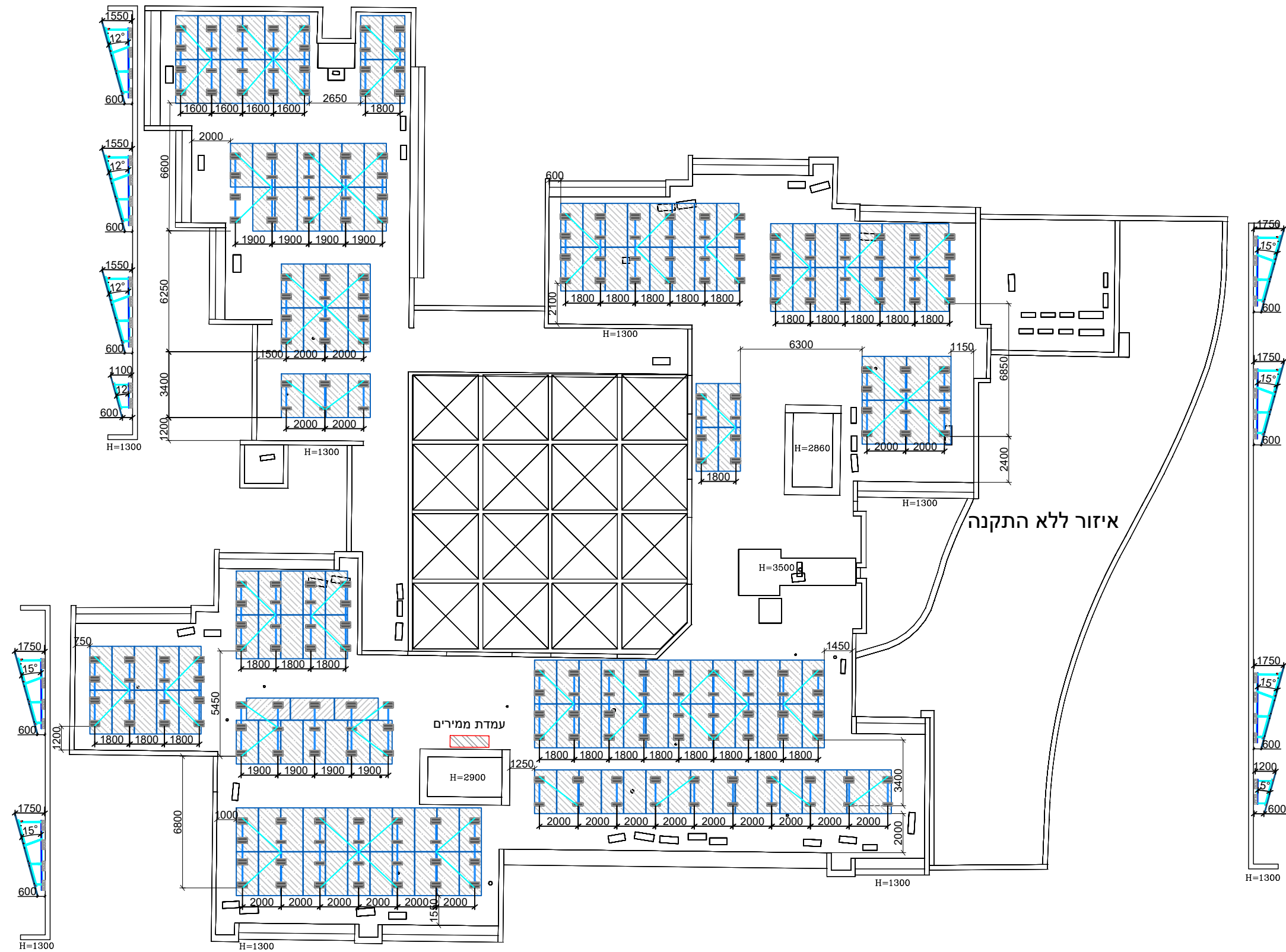
גובה: 150, רוחב: 230, אורך: 500



פרט התקנת קונסטרוקציה



יש לוודא מול קונסטרוקטור את תוכנית ההצבה, כמות האבנים
וחוזק הקונסטרוקציה הנושאת לפני ביצוע ההתקנה



Title: תוכנית קונסטרוקציה

Client: שחר אנרגיה

Site location: רמת גן

Drawing number:

Armonim school - B001

Date: 14/07/2021

Scale: ###

Print size: A3

Sheet: 1/1

Designer: Roi Nakash

Approved:

Status:

Rev:

לאישור

A 1

Rev

Date

Drawn

Comments

A 1

14/07/21

Roi N.

Layout Update

Manuf:

Model:

Quant:

Tilt:

Azimuth:

T.Power:

Manuf:

Model A:

Model B:

Model C:

Model D:

T.Power:

Chint [2256x1133x35]

540W

179

15°

180°

96.66kWp

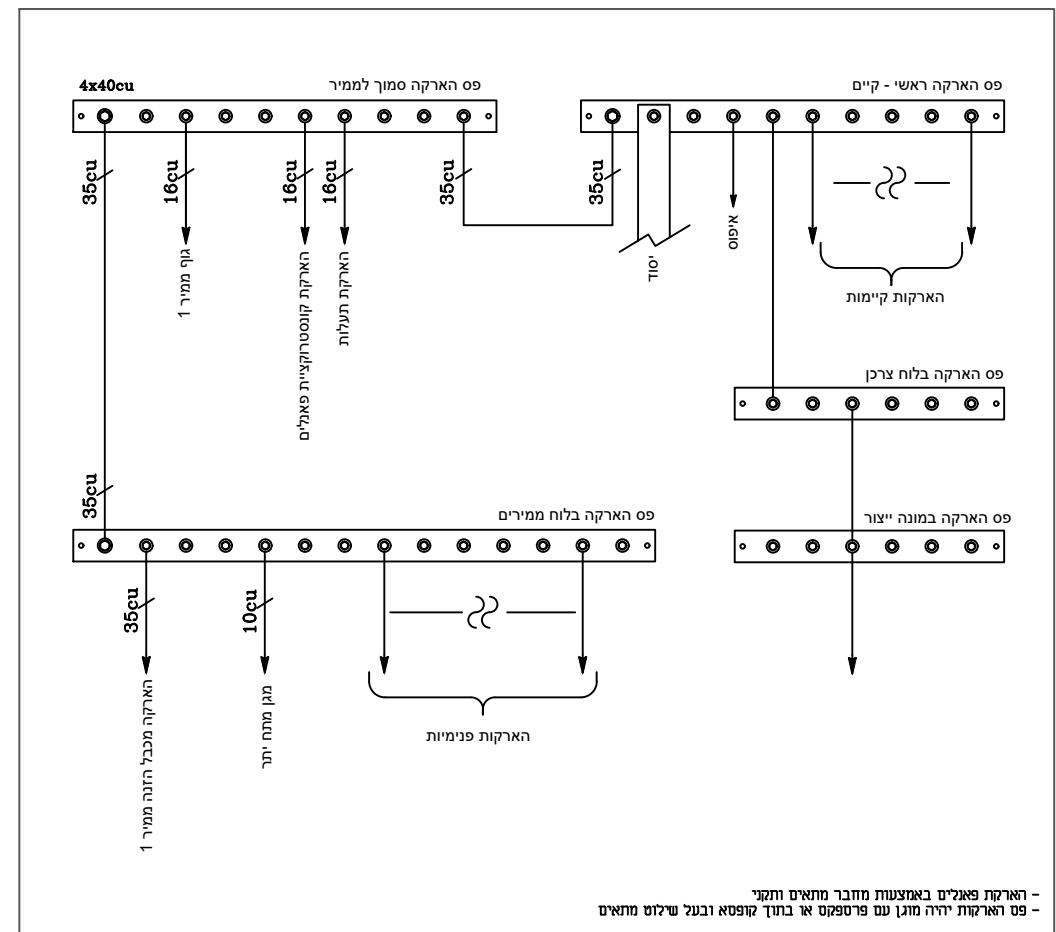
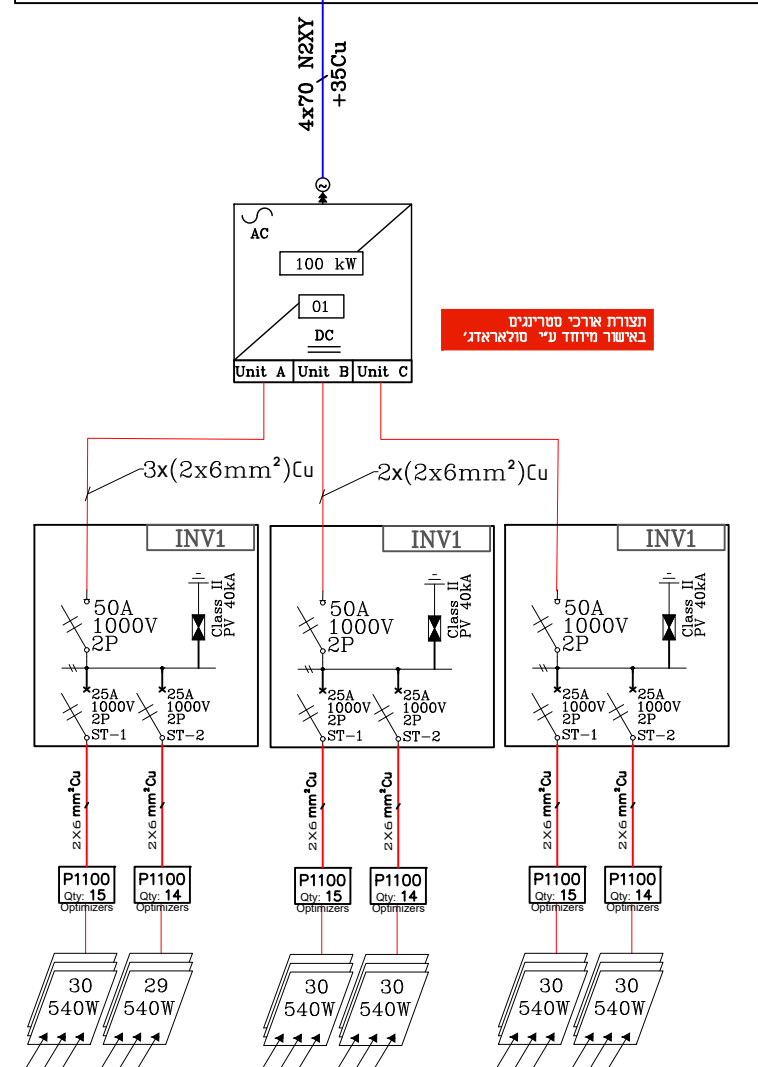
Solar Edge

100kW [96.66kW]

96.66kW

Quant

1



- Notes:
1. Elec. panel should be compatible with IL elec. norm 61439
 2. Cables, cores, ducts and modules should be marked with proper marking
 3. Live elec. contacts must be insulated

Armonim Single Line

בית ספר ערמונים, רמת גן - חלוקה לסטרינגים/ממירים						540	הספק פאנל בודד (W)			
						179	מ"ס פאנלים כלל :			
						96.66	הספק כללי AC (kW) :			
						96.66	הספק כללי DC (kW) :			
						100.00%	יחס AC/DC :			
AC/DC	(kW) AC	הספק DC (kW)	מ"ס פאנלים	P1100	אופטימיזציה	מ"ס סטרינגים	כניסת mppt	סוג ממיר (kW)	ממיר	גג
100.00%	96.66	96.66	30	15	2	Right	SE 100kW [96.66kW]	1	בטון	
			29	15						
			30	15	2	Center				
			30	15						
			30	15						
			30	15	2	Left				
			30	15						
100.00%	96.66	96.66	179	90						סה"כ כמות:

Title: תוכנית חד קווית		DRAWING NUMBER: Armonim school - E001				REV DATE DRAWN COMMENTS				Panels		Inverters		Quant'
Client: שחר אנרגיה	Site location: רמת גן	DATE: 30/8/21	Scale: ####	Print size: A3	Sheet: 1/1	A 1	14/07/21	Roi N.	Layout Update	Manuf.:'	Chint [2256x1133x35]	Manuf.:'	Solar Edge	
										Model:	540W	Model A:	100kW [96.66kW]	1
										Quant:'	179	Model B:		
										Tilt:	15°	Model C:		
										Azimuth:	180°	Model D:		
										T.Power:	96.66kWp	T.Power:	96.66kW	
		Designer: Roi Nakash			APPROVAL / STAMP									
		Approved:												
		STATUS: לאישור REV: A 1												

DC CABLE CALCULATION & POWER LOSSES

DATA		Cable Calculation										Production Losses	
Module Type	540	mm^2	Copper			Aluminum						Grid Load	100%
Imp [A]	12.86		4	6	16	25	35	50	95	120	240	Power Losses	0.25%
Vmp [V]	41.60												
Module amount	179	Length										Power Losses	
Total Power [kWp]	96,660		0	410	0	0	0	0	0	0	0		243W

Inverter	Module No'	Module No' Inv/String	Parallel Strings	Power [W]	Current [A]	Max Current Carrying Capacity [A]	Resistance [Ω/1000m]	No' Cable Sets	Cross section [mm^2]	Cable Lengh [M]	Voltage Drop [V]	Power losses [W]	ΔP %	
01				96660										
ST-1	30	30	1	16200	12.86	36.75	3.59	1	6	25	2	30	0.18%	String Losses
ST-2	29	29	1	15660	12.86	36.75	3.59	1	6	30	3	36	0.23%	
ST-3	30	30	1	16200	12.86	36.75	3.59	1	6	30	3	36	0.22%	
ST-4	30	30	1	16200	12.86	36.75	3.59	1	6	35	3	42	0.26%	DCCB / DCB to INV Losses
ST-5	30	30	1	16200	12.86	36.75	3.59	1	6	30	3	36	0.22%	String Losses
ST-6	30	30	1	16200	12.86	36.75	3.59	1	6	55	5	65	0.40%	
												243	0.25%	Total losses
												243	0.25%	TOTAL

96,660

TOTAL

DATA				AC CABLE CALCULATION & POWER LOSSES																Production Losses			
Module Type	540	Voltage [V]	400																	Avg' Voltage Drop	0.93%		
Imp [A]	12.86	Load [%]	100%	Max Voltage Drop	0.93%																		
Vmp [V]	41.60	Cos Ph	1	Power Losses	0.92%																		
Module amount	179	Total Power [kVA]	68.00		892.41W																		
Total Power [kWp]	96,660																						
FROM	TO	Module amount DC	DC Power [kW]	AC Power [kVA]	MAX AC Current [A]	Cable Length [m]	Cable Type		Cross Section [mm^2]	No' Cable sets	Installation type	K1	K2	K3	K4	Max Current Carrying Capacity [A]	R (at cable temp.) [Ω/Km]	Z (impedance) [Ω/Km]	ΔU Cable [V]	Power Losses [W]	ΔU Cable [%]	ΔU AC Line [%]	Power Losses [%]
INV 1	LVP	179	96.7	100.00	144.34	4	4x70 NA2XY	Copper	70	1	Air	0.95	0.88	1	1	138.8	0.284	0.295	0.30	70.9	0.07%	0.93%	0.04%
LVP	IEC Meter	179	96.7	100.00	144.34	50	4x120 NA2XY	Aluminum	120	1	Air	0.95	1	1	1	164.4	0.263	0.275	3.43	821.5	0.86%	0.86%	0.46%
AC [kVA]	96.66																		892.4	Toatl Losses		0.92%	

PVsyst - Simulation report

Grid-Connected System

Project: SHR Ramat Gan Armonim

Variant: New simulation variant

Tables on a building

System power: 96.1 kWp

Ramat Yitzhak - Israel

Author

Green Panel (Israel)



Project: SHR Ramat Gan Armonim

Variant: New simulation variant

PVsyst V7.2.8

VC2, Simulation date:
18/11/21 16:38
with v7.2.8

Project summary

Geographical Site

Ramat Yitzhak

Israel

Situation

Latitude 32.08 °N

Longitude 34.83 °E

Altitude 48 m

Time zone UTC+2

Project settings

Albedo 0.20

Meteo data

Ramat Yitzhak

Meteonorm 7.3 (1990-2004), Sat=100% - Synthetic

System summary

Grid-Connected System

PV Field Orientation

Fixed plane

Tilt/Azimuth 15 / 0 °

Tables on a building

Near Shadings

According to strings

Electrical effect 100 %

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules 178 units

Pnom total 96.1 kWp

Inverters

Nb. of units 3 units

Pnom total 99.9 kWac

Pnom ratio 0.962

Results summary

Produced Energy 160.7 MWh/year Specific production 1672 kWh/kWp/year Perf. Ratio PR 76.62 %

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
Special graphs	8

**PVsyst V7.2.8**

VC2, Simulation date:
18/11/21 16:38
with v7.2.8

General parameters**Grid-Connected System****PV Field Orientation****Orientation**

Fixed plane
Tilt/Azimuth 15 / 0 °

Horizon

Free Horizon

Tables on a building**Sheds configuration**

Nb. of sheds 17 units
Sizes
Sheds spacing 8.86 m
Collector width 4.12 m
Ground Cov. Ratio (GCR) 46.5 %

Near Shadings

According to strings
Electrical effect 100 %

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

User's needs

Unlimited load (grid)

PV Array Characteristics**PV module**

Manufacturer Longi Solar
Model LR5-72 HPH 540 M
(Original PVsyst database)

Unit Nom. Power 540 Wp
Number of PV modules 178 units
Nominal (STC) 96.1 kWp

SolarEdge Power Optimizer

Model P1100 Worldwide
Unit Nom. Power 1100 W
Modules 1 String x 2 in series

Array #1 - PV Array

Number of PV modules 150 units
Nominal (STC) 81.0 kWp
Optimizer Array 5 Strings x 15 In series

At operating cond. (50°C)

Pmpp 74.0 kWp
Output of optimizers
Voper 750 V
I at Poper 99 A

Array #2 - Sub-array #2

Number of PV modules 28 units
Nominal (STC) 15.12 kWp
Optimizer Array 1 String x 14 In series

At operating cond. (50°C)

Pmpp 13.82 kWp
Output of optimizers
Voper 750 V
I at Poper 18 A

Total PV power

Nominal (STC) 96 kWp
Total 178 modules
Module area 455 m²
Cell area 413 m²

Inverter

Manufacturer SolarEdge
Model SE66.6K/SE100K-EU-APAC/AUS Unit (400V)
(Original PVsyst database)

Unit Nom. Power 33.3 kWac
Number of inverters 3 units
Total power 99.9 kWac

Number of inverters 2.5 units
Total power 84.2 kWac

Operating voltage 750 V
Pnom ratio (DC:AC) 0.90

Number of inverters 0.5 unit
Total power 15.7 kWac

Operating voltage 750 V
Pnom ratio (DC:AC) 0.90

Total inverter power

Total power 99.9 kWac
Nb. of inverters 3 units
Pnom ratio 0.96

**PVsyst V7.2.8**

VC2, Simulation date:
18/11/21 16:38
with v7.2.8

Array losses**Array Soiling Losses**

Loss Fraction 3.0 %

Thermal Loss factor

Module temperature according to irradiance
Uc (const) 25.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

LID - Light Induced Degradation

Loss Fraction 2.0 %

Module Quality Loss

Loss Fraction 0.0 %

Module mismatch losses

Loss Fraction (Fixed voltage) 0.0 %

Strings Mismatch loss

Loss Fraction 0.1 %

IAM loss factor

ASHRAE Param: IAM = 1 - bo(1/cosi - 1)
bo Param. 0.05

DC wiring losses

Global wiring resistance 10 mΩ
Loss Fraction 1.5 % at STC

Array #1 - PV Array

Global array res. 104 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 557 mΩ
Loss Fraction 1.5 % at STC

System losses**Unavailability of the system**

Time fraction 2.0 %
7.3 days,
3 periods

AC wiring losses**Inv. output line up to injection point**

Inverter voltage 400 Vac tri
Loss Fraction 1.50 % at STC

Global System

Wire section Alu 3 x 70 mm²
Wires length 57 m

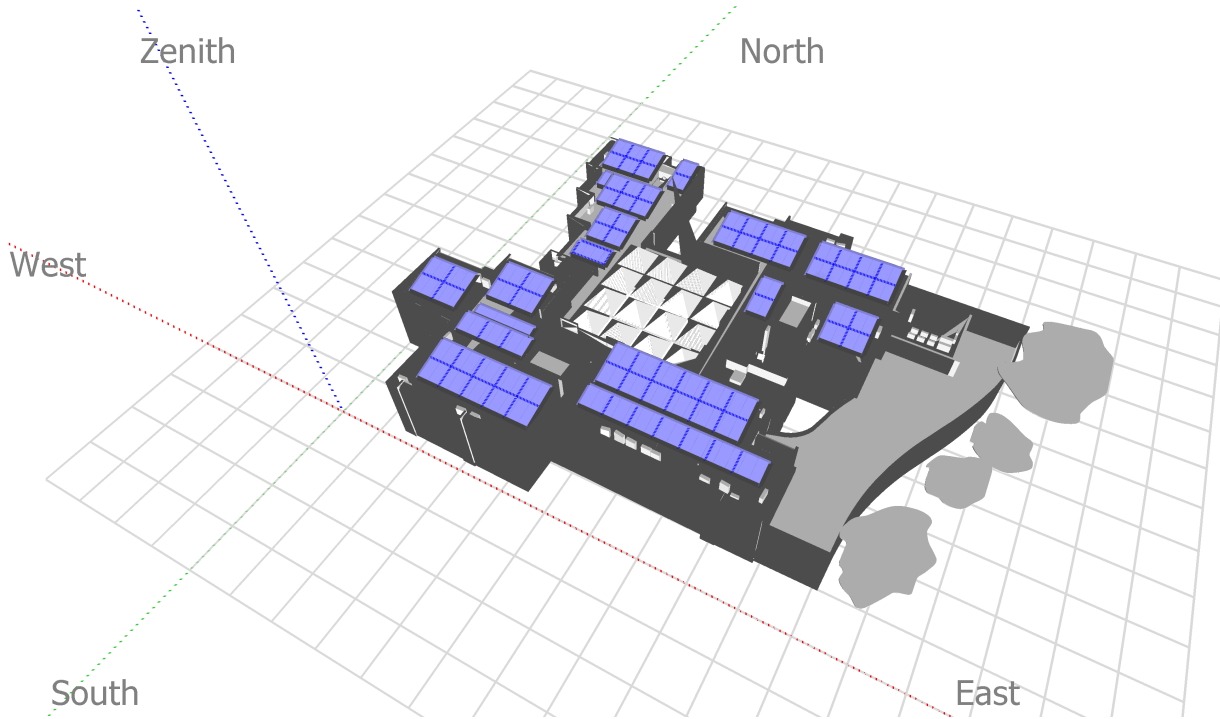


PVsyst V7.2.8

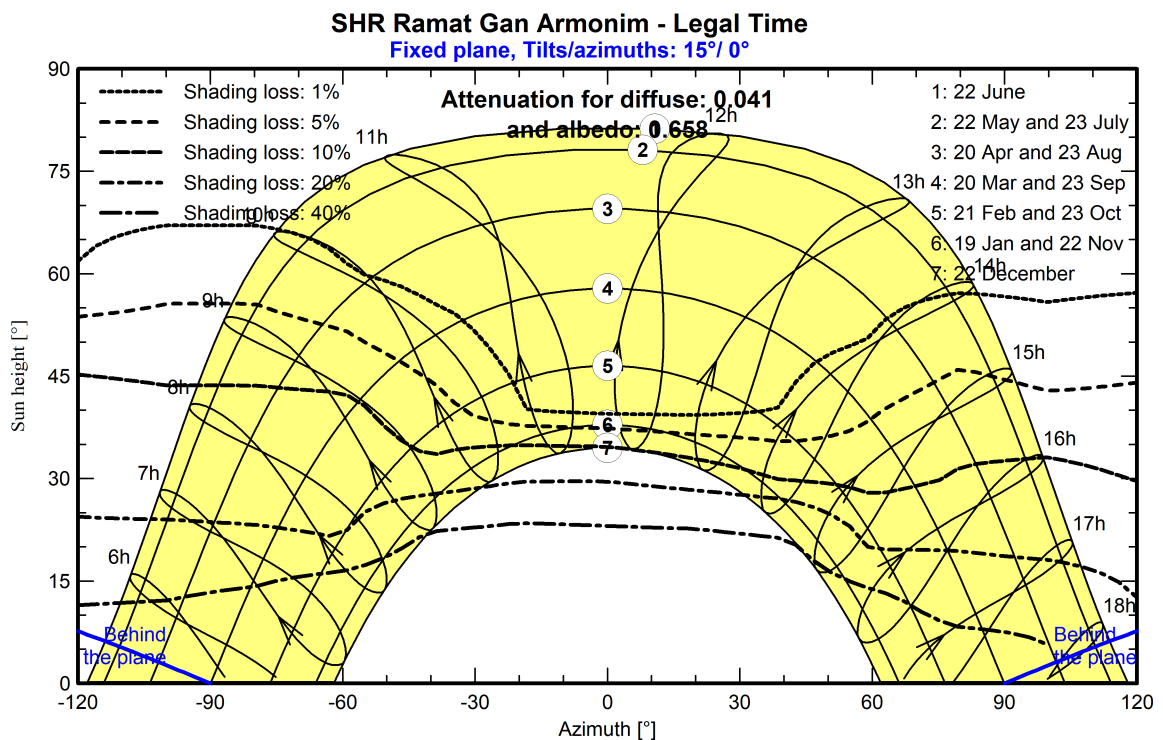
VC2, Simulation date:
18/11/21 16:38
with v7.2.8

Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram





PVsyst V7.2.8

VC2, Simulation date:

18/11/21 16:38

with v7.2.8

Main results

System Production

Produced Energy

160.7 MWh/year

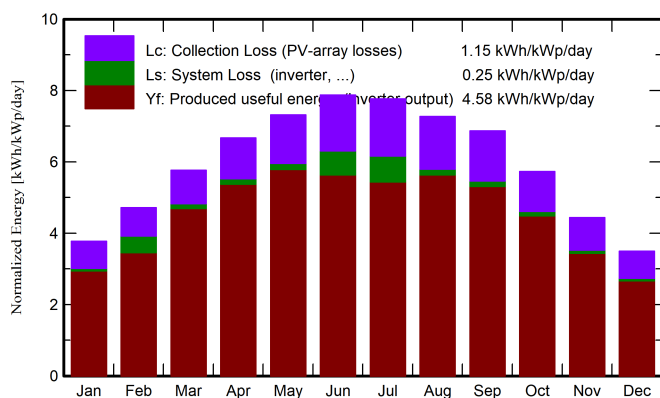
Specific production

1672 kWh/kWp/year

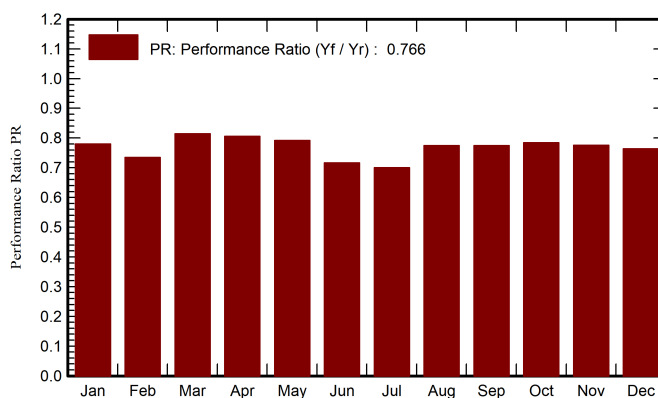
Performance Ratio PR

76.62 %

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	MWh	MWh	ratio
January	92.1	38.67	12.89	116.9	105.7	9.00	8.77	0.780
February	110.6	46.31	13.53	132.0	121.3	10.57	9.32	0.735
March	159.8	62.32	16.27	178.7	166.0	14.38	13.98	0.814
April	190.0	71.88	19.23	200.1	186.7	15.95	15.50	0.806
May	226.6	76.21	22.47	226.8	211.8	17.76	17.26	0.792
June	241.9	59.57	25.29	236.1	220.9	18.20	16.27	0.717
July	244.0	61.51	28.18	240.7	225.2	18.37	16.21	0.700
August	218.2	67.04	28.43	225.5	210.8	17.28	16.79	0.775
September	186.5	47.45	26.36	205.9	191.7	15.78	15.33	0.775
October	149.5	46.08	23.76	177.5	163.7	13.75	13.37	0.784
November	105.0	34.10	18.84	133.0	121.9	10.19	9.92	0.776
December	84.7	38.07	15.00	108.3	97.9	8.16	7.95	0.764
Year	2008.9	649.21	20.90	2181.6	2023.6	169.38	160.67	0.766

Legends

GlobHor Global horizontal irradiation

DiffHor Horizontal diffuse irradiation

T_Amb Ambient Temperature

GlobInc Global incident in coll. plane

GlobEff Effective Global, corr. for IAM and shadings

EArray Effective energy at the output of the array

E_Grid Energy injected into grid

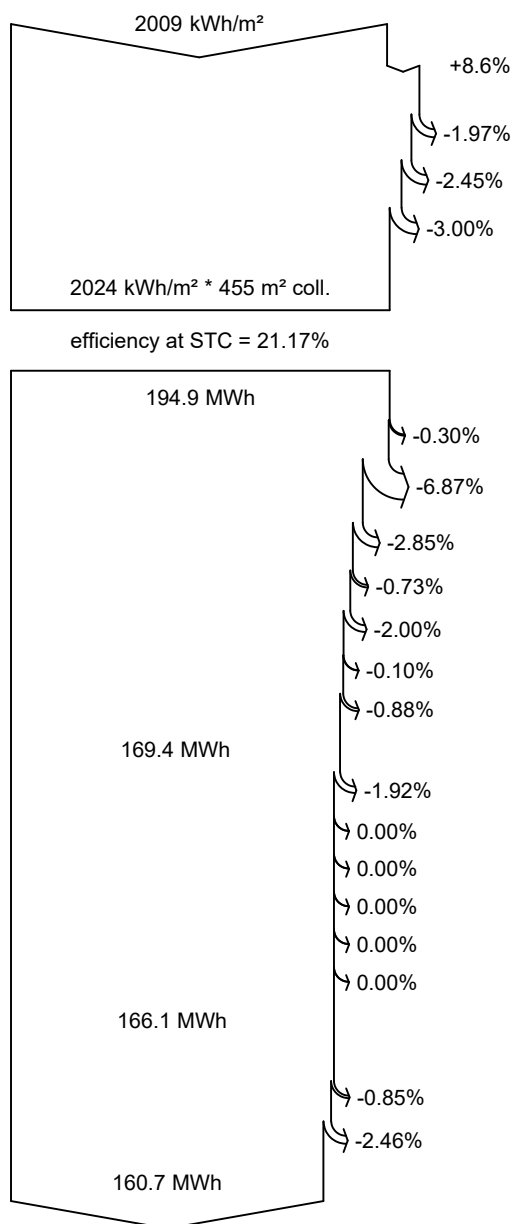
PR Performance Ratio



PVsyst V7.2.8

VC2, Simulation date:
18/11/21 16:38
with v7.2.8

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

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

Shadings: Electrical Loss acc. to strings

Optimizer efficiency loss

LID - Light induced degradation

Mismatch loss, modules and strings

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

Available Energy at Inverter Output

AC ohmic loss

System unavailability

Energy injected into grid

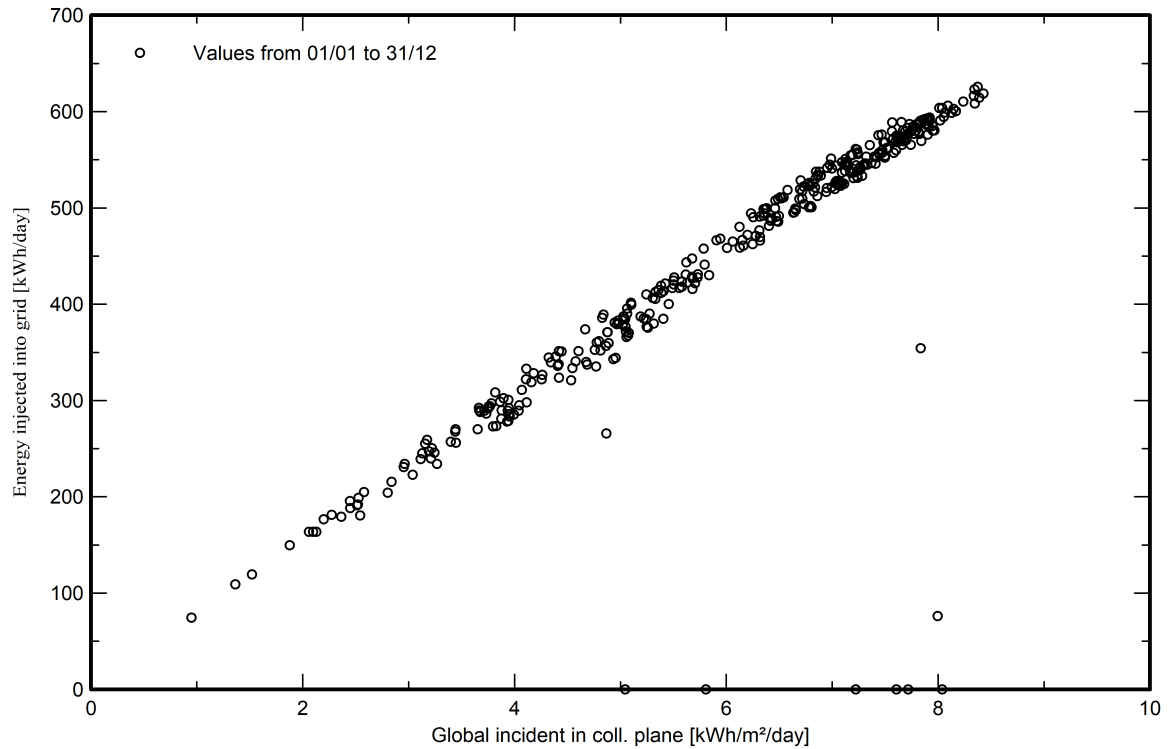


PVsyst V7.2.8

VC2, Simulation date:
18/11/21 16:38
with v7.2.8

Special graphs

Daily Input/Output diagram



System Output Power Distribution

