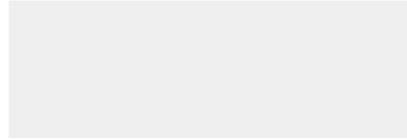


**VEESLA UAB**

Galinės g. 8, Galinė, Avižienių sen., Vilniaus r.  
14247  
Lietuva



2023-07-04

## Your PV system from VEESLA UAB

### Address of Installation

Kaimiško k., Miežiškių sen., Panevėžio r. sav.



## Project Overview



Figure: Overview Image, 3D Design

## PV System

### 3D, Grid-connected PV System

Climate Data	Panevežys, LTU (1996 - 2015)
Values source	Meteonorm 8.1(i)
PV Generator Output	85,49 kWp
PV Generator Surface	402,3 m <sup>2</sup>
Number of PV Modules	206
Number of Inverters	2

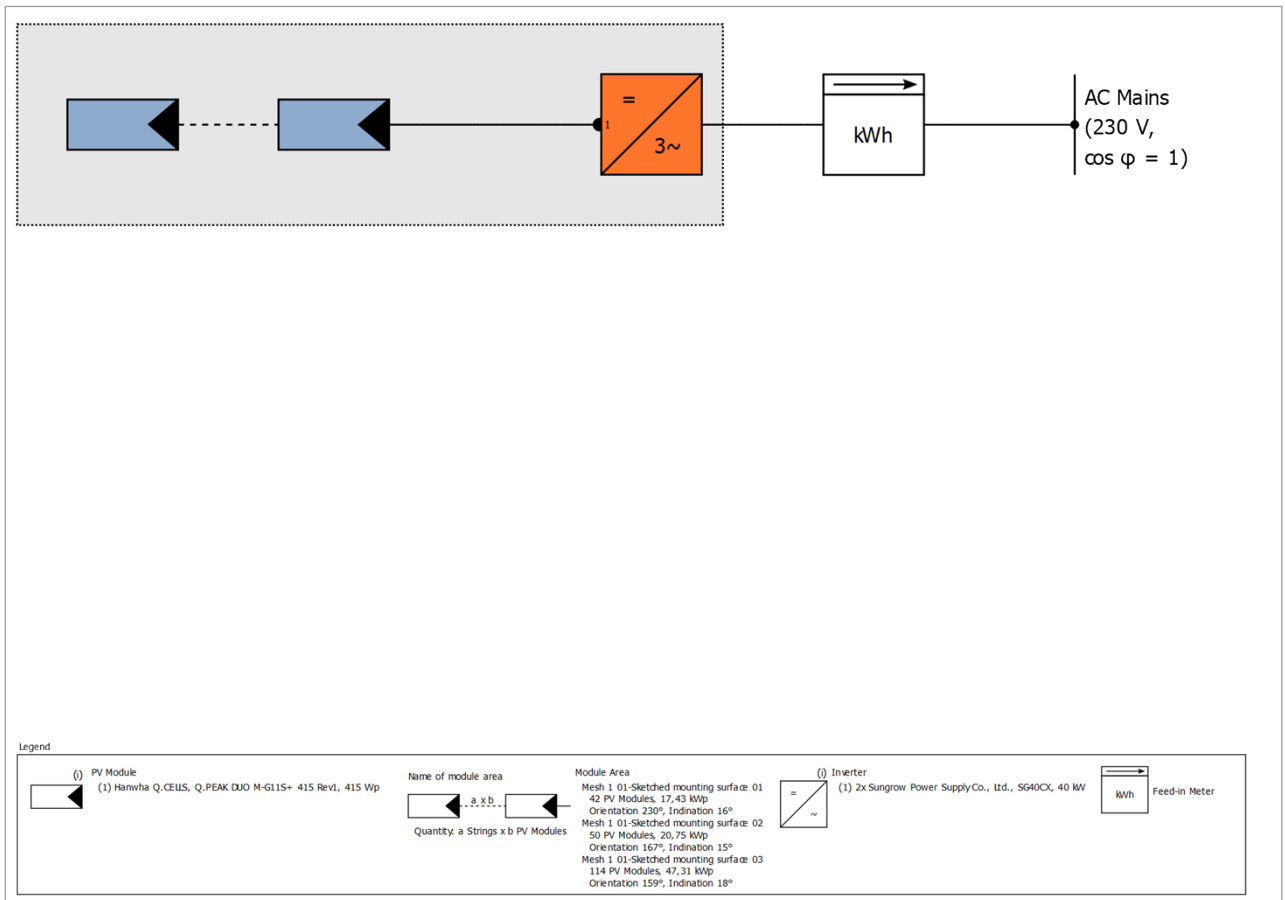


Figure: Schematic diagram

## Production Forecast

### Production Forecast

PV Generator Output	85,49 kWp
Spec. Annual Yield	981,54 kWh/kWp
Performance Ratio (PR)	87,95 %
Yield Reduction due to Shading	6,0 %
Grid Export	83 930 kWh/Year
Grid Export in the first year (incl. module degradation)	83 930 kWh/Year
Standby Consumption (Inverter)	17 kWh/Year
CO <sub>2</sub> Emissions avoided	39 439 kg / year

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	Panevežys, LTU (1996 - 2015)
Values source	Meteonorm 8.1(i)
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 - Mesh 1 01-Sketched mounting surface 01

#### PV Generator, 1. Module Area - Mesh 1 01-Sketched mounting surface 01

Name	Mesh 1 01-Sketched mounting surface 01
PV Modules	42 x Q.PEAK DUO M-G11S+ 415 Rev1 (v1)
Manufacturer	Hanwha Q.CELLS
Inclination	16 °
Orientation	Southwest 230 °
Installation Type	Mounted - Roof
PV Generator Surface	82,0 m <sup>2</sup>

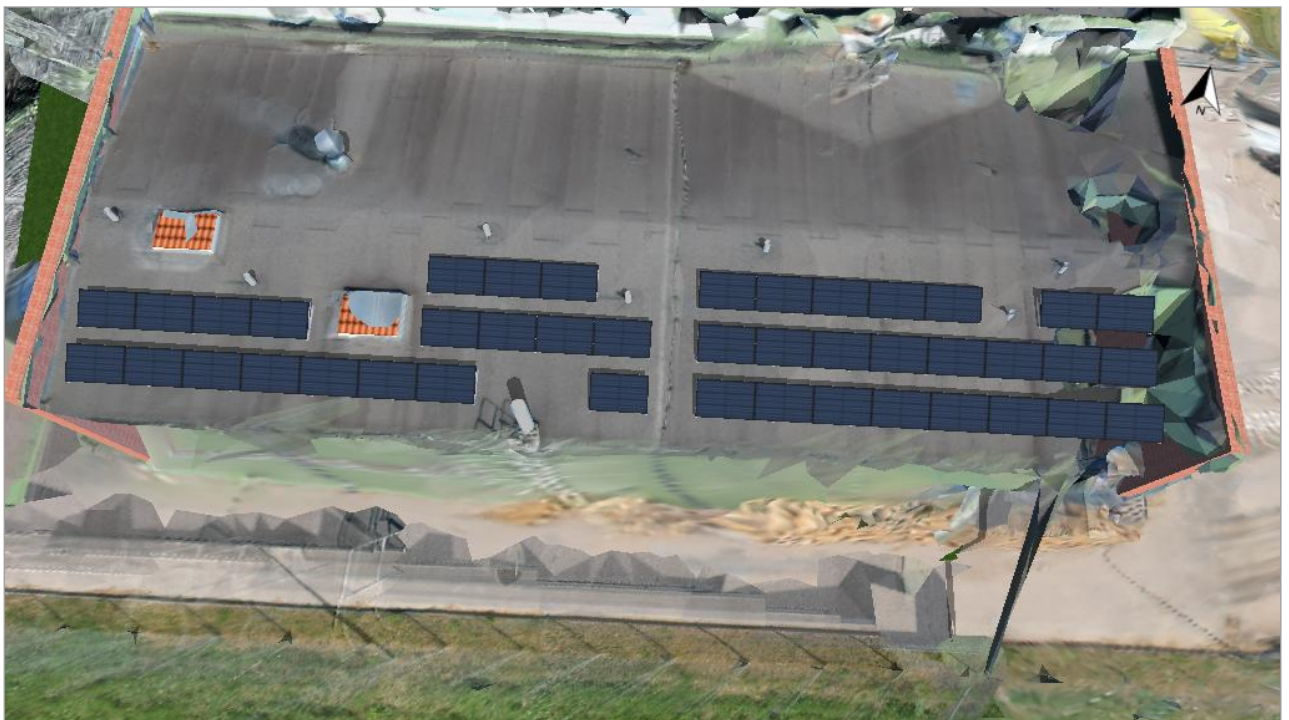


Figure: 1. Module Area - Mesh 1 01-Sketched mounting surface 01

## 2. Module Area - Mesh 1 01-Sketched mounting surface 02

### PV Generator, 2. Module Area - Mesh 1 01-Sketched mounting surface 02

Name	Mesh 1 01-Sketched mounting surface 02
PV Modules	50 x Q.PEAK DUO M-G11S+ 415 Rev1 (v1)
Manufacturer	Hanwha Q.CELLS
Inclination	15 °
Orientation	South 167 °
Installation Type	Mounted - Roof
PV Generator Surface	97,6 m <sup>2</sup>



Figure: 2. Module Area - Mesh 1 01-Sketched mounting surface 02

### 3. Module Area - Mesh 1 01-Sketched mounting surface 03

#### PV Generator, 3. Module Area - Mesh 1 01-Sketched mounting surface 03

Name	Mesh 1 01-Sketched mounting surface 03
PV Modules	114 x Q.PEAK DUO M-G11S+ 415 Rev1 (v1)
Manufacturer	Hanwha Q.CELLS
Inclination	18 °
Orientation	South 159 °
Installation Type	Mounted - Roof
PV Generator Surface	222,6 m <sup>2</sup>



Figure: 3. Module Area - Mesh 1 01-Sketched mounting surface 03

## Horizon Line, 3D Design

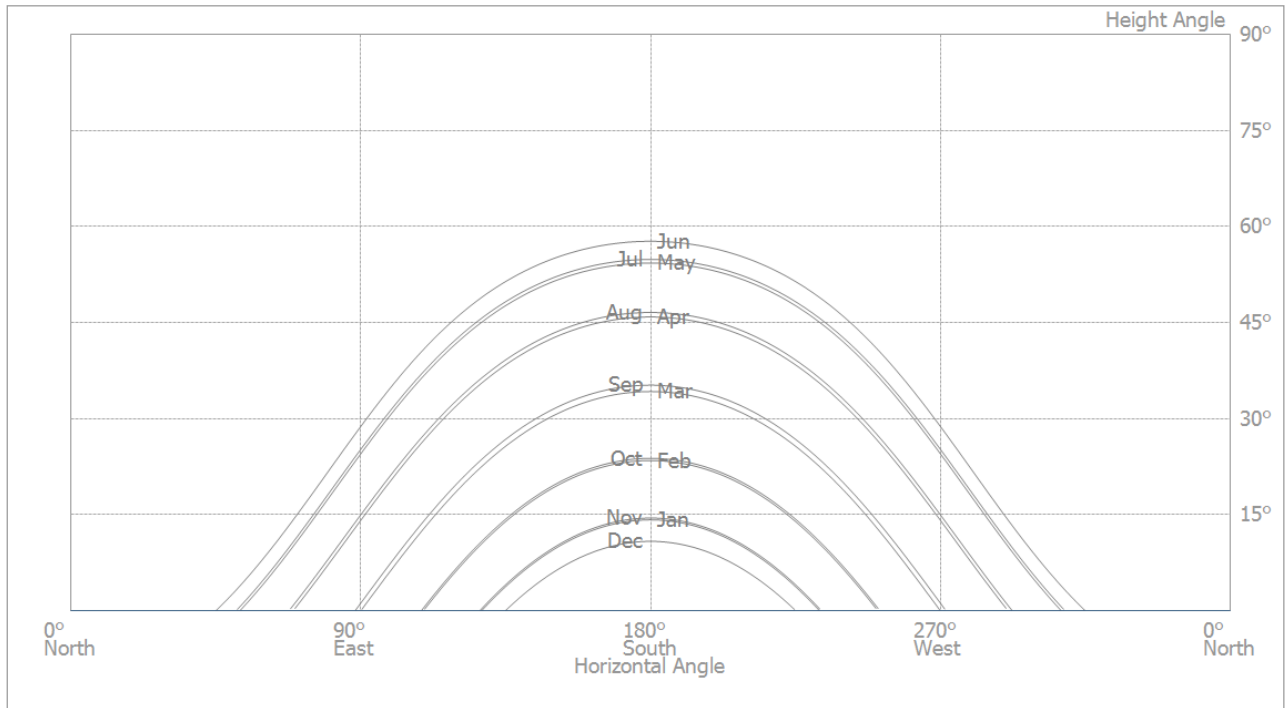


Figure: Horizon (3D Design)

## Inverter configuration

### Configuration 1

Module Areas Mesh 1 01-Sketched mounting surface 01 + Mesh 1 01-Sketched mounting surface 02 + Mesh 1 01-Sketched mounting surface 03

#### Inverter 1

Model	SG40CX (v3)
Manufacturer	Sungrow Power Supply Co., Ltd.
Quantity	1
Sizing Factor	95,5 %
Configuration	MPP 1: 2 x 14 MPP 2: 1 x 14 MPP 3: 2 x 16 MPP 4: 1 x 18

#### Inverter 2

Model	SG40CX (v3)
Manufacturer	Sungrow Power Supply Co., Ltd.
Quantity	1
Sizing Factor	118,3 %
Configuration	MPP 1: 2 x 16 MPP 2: 2 x 16 MPP 3: 2 x 16 MPP 4: 1 x 18

## AC Mains

### AC Mains

---

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

---

# Simulation Results

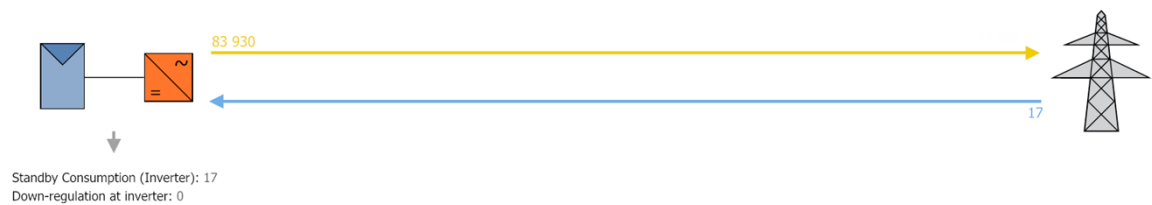
## Results Total System

### PV System

PV Generator Output	85,49 kWp
Spec. Annual Yield	981,54 kWh/kWp
Performance Ratio (PR)	87,95 %
Yield Reduction due to Shading	6,0 %
Grid Export	83 930 kWh/Year
Grid Export in the first year (incl. module degradation)	83 930 kWh/Year
Standby Consumption (Inverter)	17 kWh/Year
CO <sub>2</sub> Emissions avoided	39 439 kg / year

### Energy Flow Graph

Project: miško urédija



All values in kWh  
Small deviations in the totals can occur due to rounding  
created with PV\*SOL

Figure: Energy flow

# PV System Energy Balance

## PV System Energy Balance

<b>Global radiation - horizontal</b>	<b>1 021,20 kWh/m<sup>2</sup></b>	
Deviation from standard spectrum	-10,21 kWh/m <sup>2</sup>	-1,00 %
Ground Reflection (Albedo)	4,37 kWh/m <sup>2</sup>	0,43 %
Orientation and inclination of the module surface	103,50 kWh/m <sup>2</sup>	10,19 %
Module-independent shading	-3,20 kWh/m <sup>2</sup>	-0,29 %
Reflection on the Module Interface	0,00 kWh/m <sup>2</sup>	0,00 %
<b>Global Radiation at the Module</b>	<b>1 115,66 kWh/m<sup>2</sup></b>	
	1 115,66 kWh/m <sup>2</sup>	
	x 402,266 m <sup>2</sup>	
	= 448 790,70 kWh	
<b>Global PV Radiation</b>	<b>448 790,70 kWh</b>	
Soiling	0,00 kWh	0,00 %
STC Conversion (Rated Efficiency of Module 21,26 %)	-353 381,41 kWh	-78,74 %
<b>Rated PV Energy</b>	<b>95 409,29 kWh</b>	
Module-specific Partial Shading	-3 339,46 kWh	-3,50 %
Low-light performance	-1 877,99 kWh	-2,04 %
Deviation from the nominal module temperature	-757,83 kWh	-0,84 %
Diodes	-184,90 kWh	-0,21 %
Mismatch (Manufacturer Information)	-1 784,98 kWh	-2,00 %
Mismatch (Configuration/Shading)	-1 663,43 kWh	-1,90 %
<b>PV Energy (DC) without inverter down-regulation</b>	<b>85 800,69 kWh</b>	
Failing to reach the DC start output	-1,89 kWh	0,00 %
Down-regulation on account of the MPP Voltage Range	-11,43 kWh	-0,01 %
Down-regulation on account of the max. DC Current	-0,95 kWh	0,00 %
Down-regulation on account of the max. DC Power	0,00 kWh	0,00 %
Down-regulation on account of the max. AC Power/cos phi	-41,72 kWh	-0,05 %
MPP Matching	-7,35 kWh	-0,01 %
<b>PV energy (DC)</b>	<b>85 737,35 kWh</b>	
<b>Energy at the Inverter Input</b>	<b>85 737,35 kWh</b>	
Input voltage deviates from rated voltage	-11,33 kWh	-0,01 %
DC/AC Conversion	-1 796,60 kWh	-2,10 %
Standby Consumption (Inverter)	-17,43 kWh	-0,02 %
Total Cable Losses	0,00 kWh	0,00 %
<b>PV energy (AC) minus standby use</b>	<b>83 911,99 kWh</b>	
<b>PV Generator Energy (AC grid)</b>	<b>83 929,42 kWh</b>	

# Data Sheets

## PV Module Data Sheet

PV Module: Q.PEAK DUO M-G11S+ 415 Rev1 (v1)

Manufacturer	Hanwha Q.CELLS
Available	Yes

### Electrical Data

Cell Type	Si monocrystalline
Half-cell module	Yes
Cell Count	108
Number of Bypass Diodes	3
Loss voltage per bypass diode	1 V
Integrated power optimizer	No
Only Transformer Inverters suitable	No

### I/V Characteristics at STC

MPP Voltage	31,05 V
MPP Current	13,37 A
Open Circuit Voltage	37,14 V
Short-Circuit Current	13,99 A
Increase open circuit voltage before stabilisation	0 %
Nominal output	415 W
Fill Factor	79,9 %
Efficiency	21,26 %

### I/V Part Load Characteristics

Values source	Manufacturer/user-created
Irradiance	200 W/m <sup>2</sup>
Voltage in MPP at Part Load	29,84 V
Current in MPP at Part Load	2,671 A
Open Circuit Voltage (Part Load)	34,72 V
Short Circuit Current at Part Load	2,8 A

### Additional Parameters

Temperature Coefficient of Voc	-100,1 mV/K
Temperature Coefficient of Isc	5,6 mA/K
Temperature Coefficient of Pmpp	-0,34 %/K
Incident Angle Modifier (IAM)	100 %
Maximum System Voltage	1000 V

### Mechanical Data

Width	1134 mm
Height	1722 mm
Depth	30 mm
Frame Width	13 mm
Weight	21,1 kg

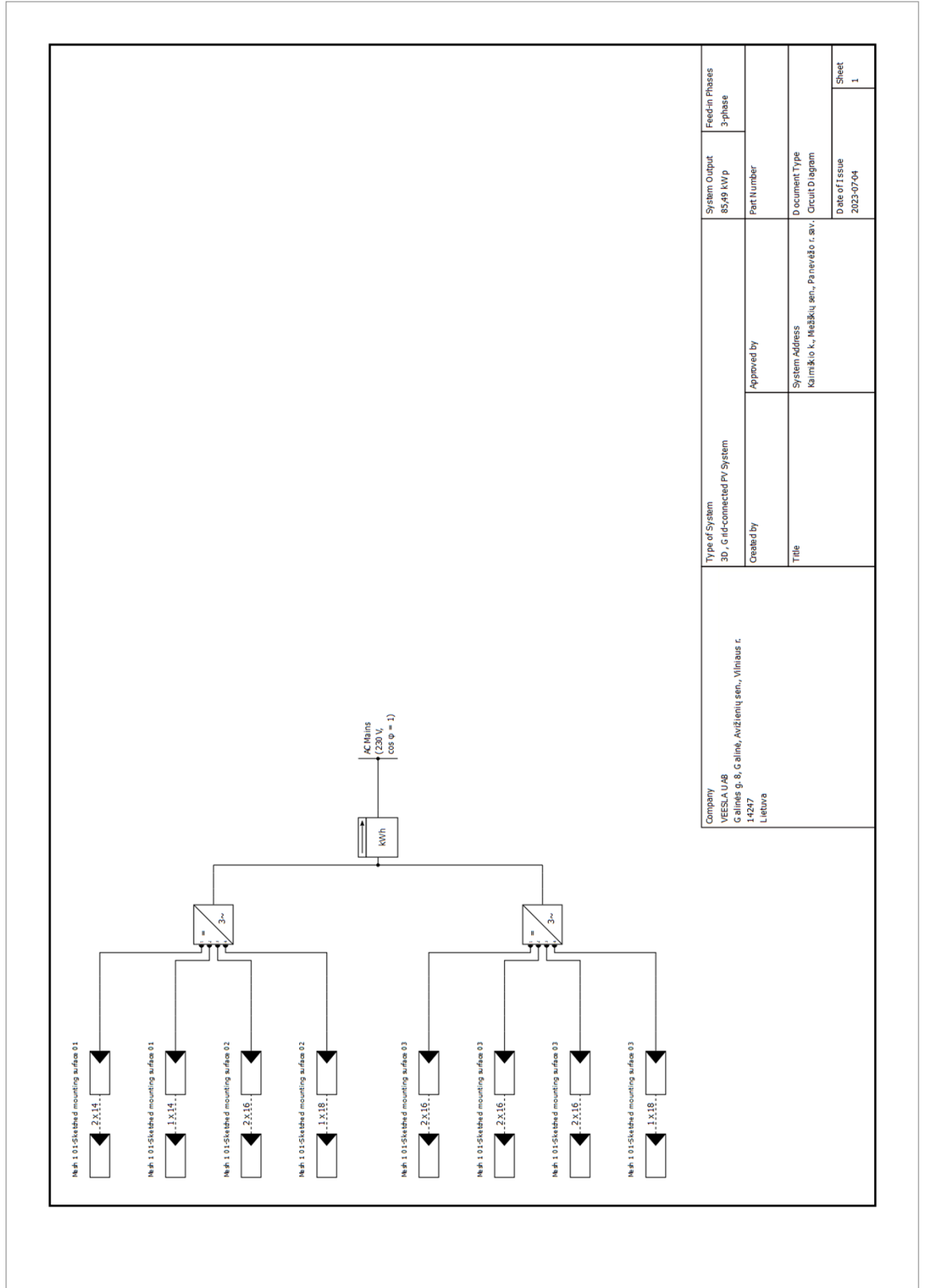
## Inverter Data Sheet

Inverter: SG40CX (v3)

Manufacturer	Sungrow Power Supply Co., Ltd.
Available	Yes
<b>Electrical data - DC</b>	
DC nominal output	40 kW
Max. DC Power	60 kW
Nom. DC Voltage	585 V
Max. Input Voltage	1100 V
Max. Input Current	139,2 A
Max. short circuit current	139,2 A
Number of DC Inlets	8
<b>Electrical data - AC</b>	
AC Power Rating	40 kW
Max. AC Power	44 kVA
Number of Phases	3
With Transformer	No
<b>Electrical data - other</b>	
Change in Efficiency when Input Voltage deviates from Rated Voltage	0,02 %/100V
Min. Feed-in Power	20 W
Standby Consumption	2 W
Night Consumption	2 W
<b>MPP Tracker</b>	
Output Range < 20% of Power Rating	99,9 %
Output Range > 20% of Power Rating	100 %
Count of MPP Trackers	4
<b>MPP Tracker 1-4</b>	
Max. Input Current	26 A
Max. short circuit current	26 A
Max. Input Power	22,1 kW
Min. MPP Voltage	200 V
Max. MPP Voltage	1000 V

# Plans and parts list

## Circuit Diagram



Company VEESLA UAB G alinės g. 8, C ailinė, Avižienių sen., Vilnius r. 14247 Lietuva	Type of System 3D / Grid-connected PV System	System Output 8549 kWp	Feed-in Phases 3-phase
	Created by	Part Number	
	Approved by	Document Type Circuit Diagram	
	Title	Date of Issue 2023-07-04	Sheet 1

Figure: Circuit Diagram

# Overview plan

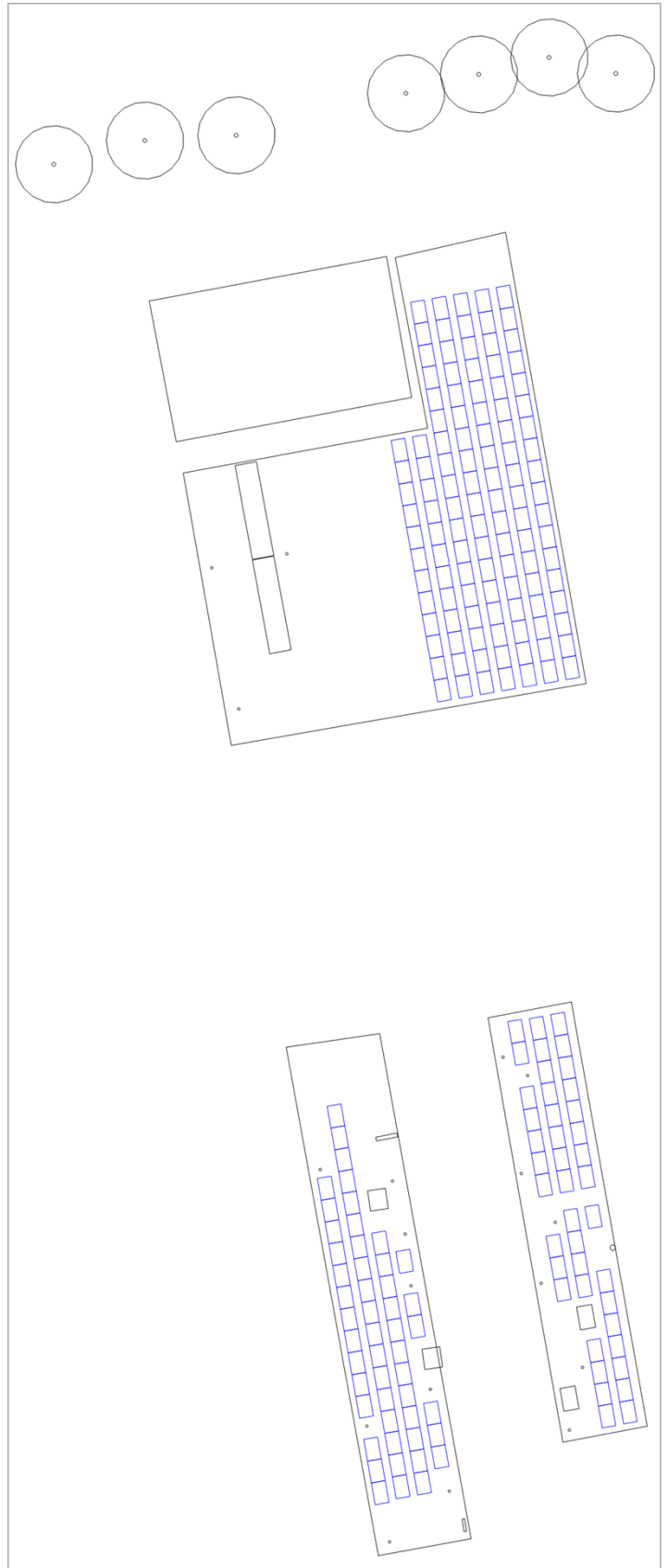


Figure: Overview plan

## Parts list

### Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		Hanwha Q.CELLS	Q.PEAK DUO M-G11S+ 415 Rev1	206	Piece
2	Inverter		Sungrow Power Supply Co., Ltd.	SG40CX	2	Piece
3	Components			Feed-in Meter	1	Piece

# Screenshots, 3D Design Environment



Figure: Screenshot05



Figure: pietus

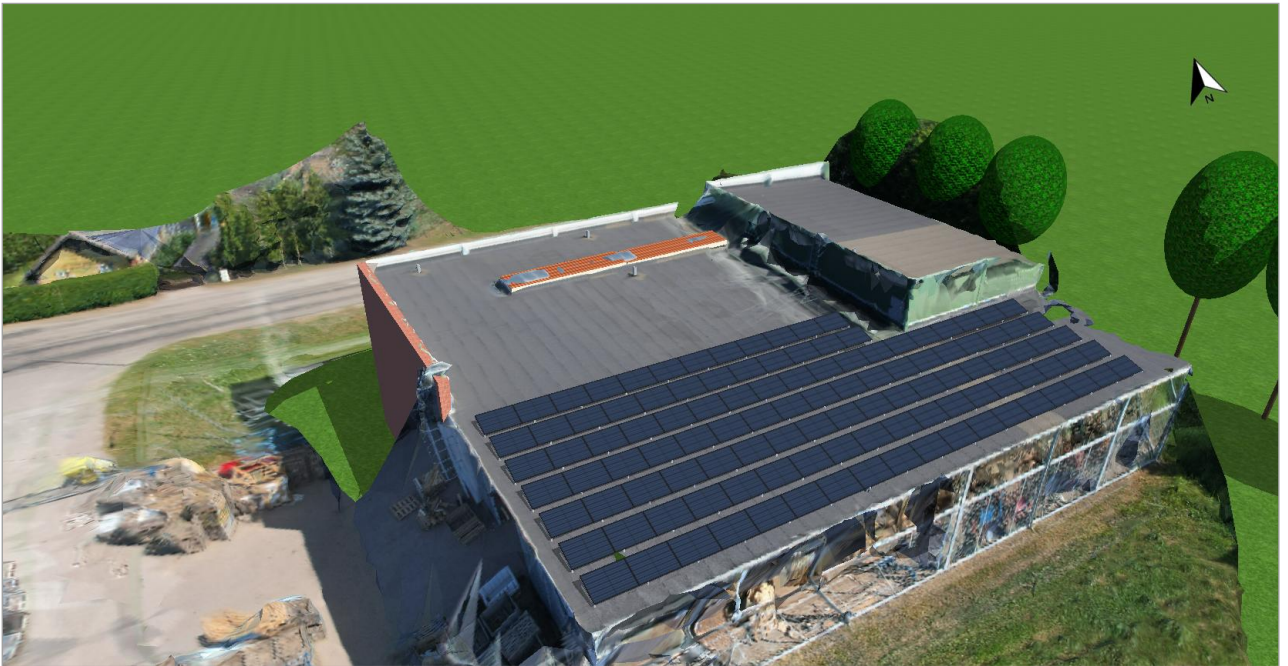


Figure: Screenshot07



Figure: Screenshot08



Figure: Screenshot09



Figure: Screenshot10

# Configuration



Figure: Screenshot04

# Shading

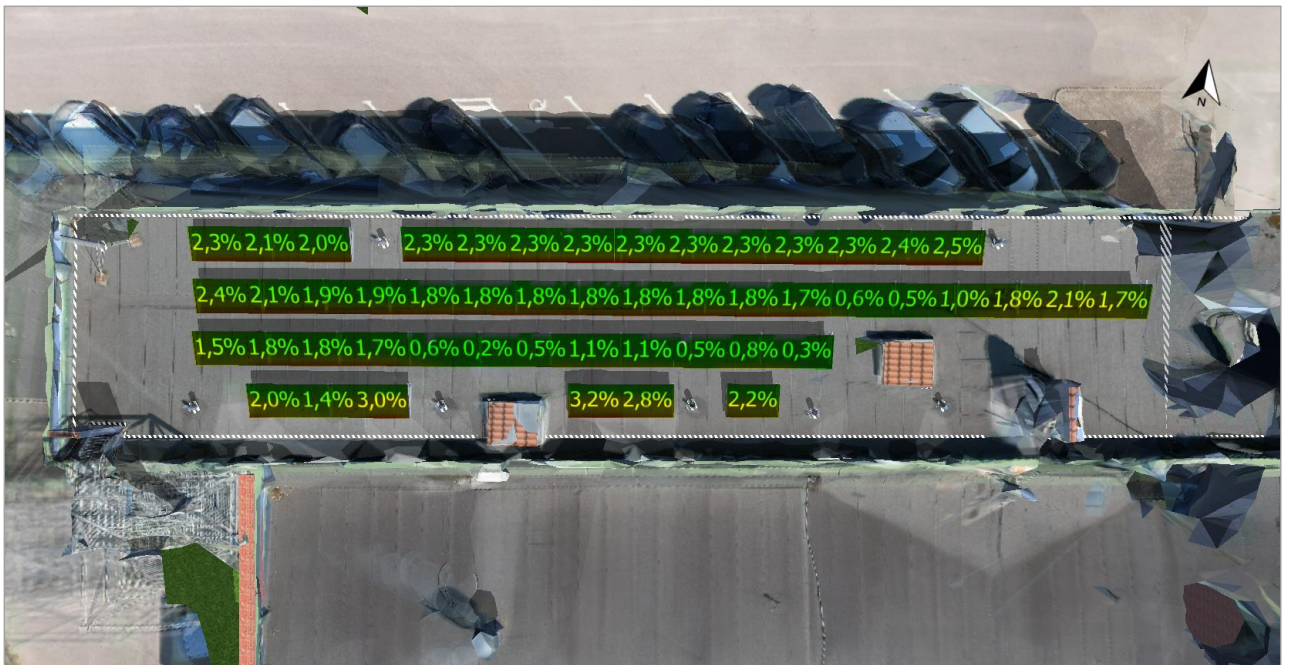


Figure: Screenshot01

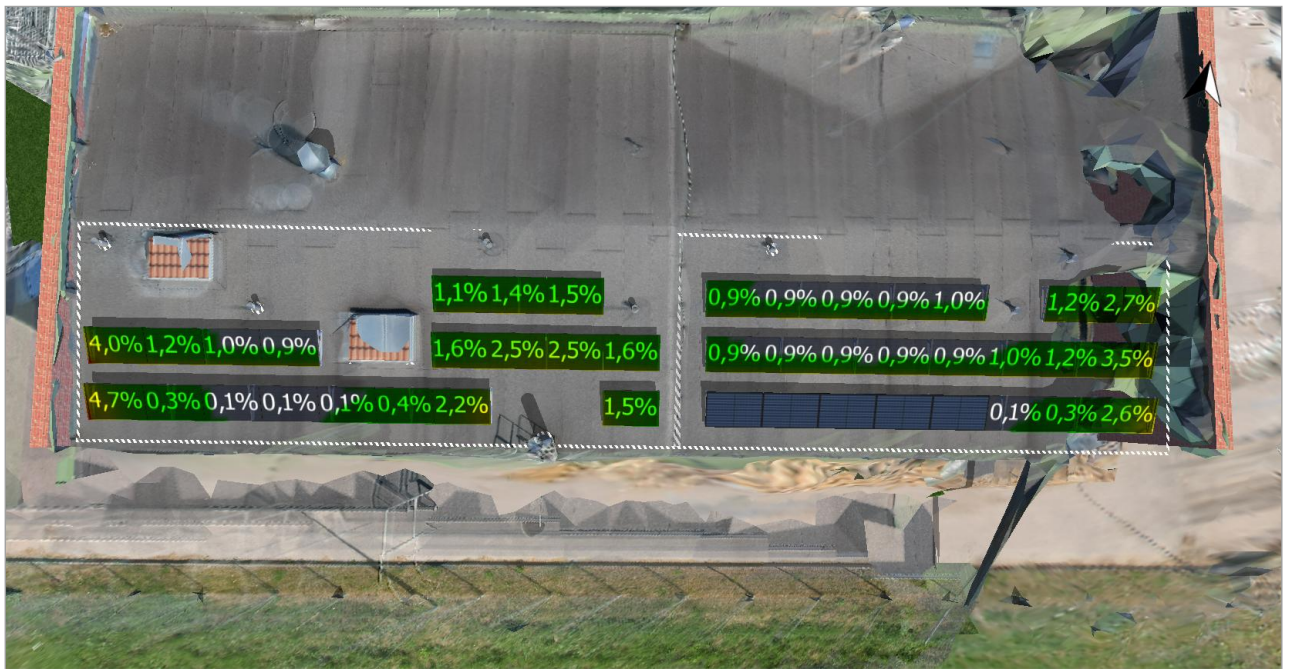


Figure: Screenshot02



Figure: Screenshot03