Vardas Pavardė
Gatvė: ---
Miestas: Kaunas
Pašto kodas: LT-53363

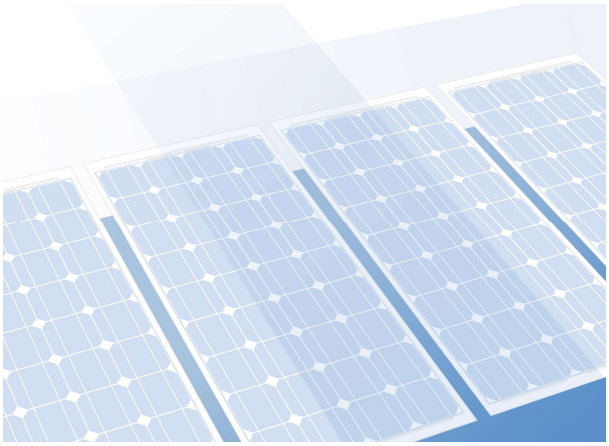
Project Name: Saulės elektrinės projektas

2023-05-11

Your PV system

Address of Installation

Gatvė: ---
Miestas: Kaunas
Pašto kodas: LT-53363



Project Overview

PV System

Grid-connected PV System with Electrical Appliances

Climate Data	Kaunas, LTU (1996 - 2015)
Values source	Meteonorm 8.1
PV Generator Output	9,96 kWp
PV Generator Surface	48,0 m²
Number of PV Modules	24
Number of Inverters	1

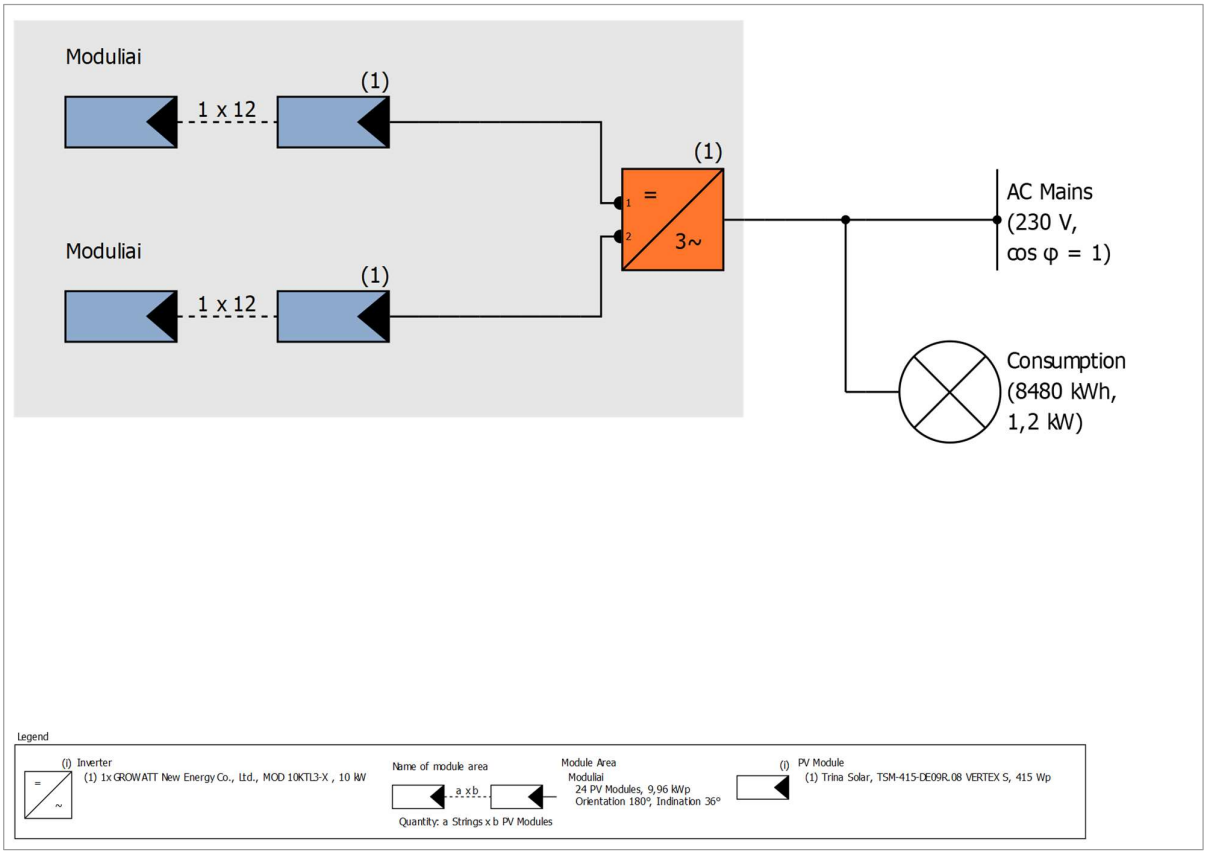


Figure: Schematic diagram

Production Forecast

Production Forecast		
PV Generator Output	9,96	kWp
Spec. Annual Yield	1 107,40	kWh/kWp
Performance Ratio (PR)	92,76	%
PV Generator Energy (AC grid)	11 040	kWh/Year
Own Consumption	3 242	kWh/Year
Down-regulation at Feed-in Point	0	kWh/Year
Grid export	7 798	kWh/Year
Own Power Consumption	29,3	%
CO_2 Emissions avoided	5 184	kg / year
Level of Self-sufficiency	38,2	%

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	Grid-connected PV System with Electrical Appliances
Start of Operation	2023-05-10

Climate Data

Location	Kaunas, LTU (1996 - 2015)
Values source	Meteonorm 8.1
Resolution of the data	1 h
Simulation models used:	
- Diffuse Irradiation onto Horizontal Plane	Hofmann
- Irradiance onto tilted surface	Hay & Davies

Consumption

Total Consumption	8480 kWh
Energijos suvartojimas	8480 kWh
Load Peak	1,2 kW

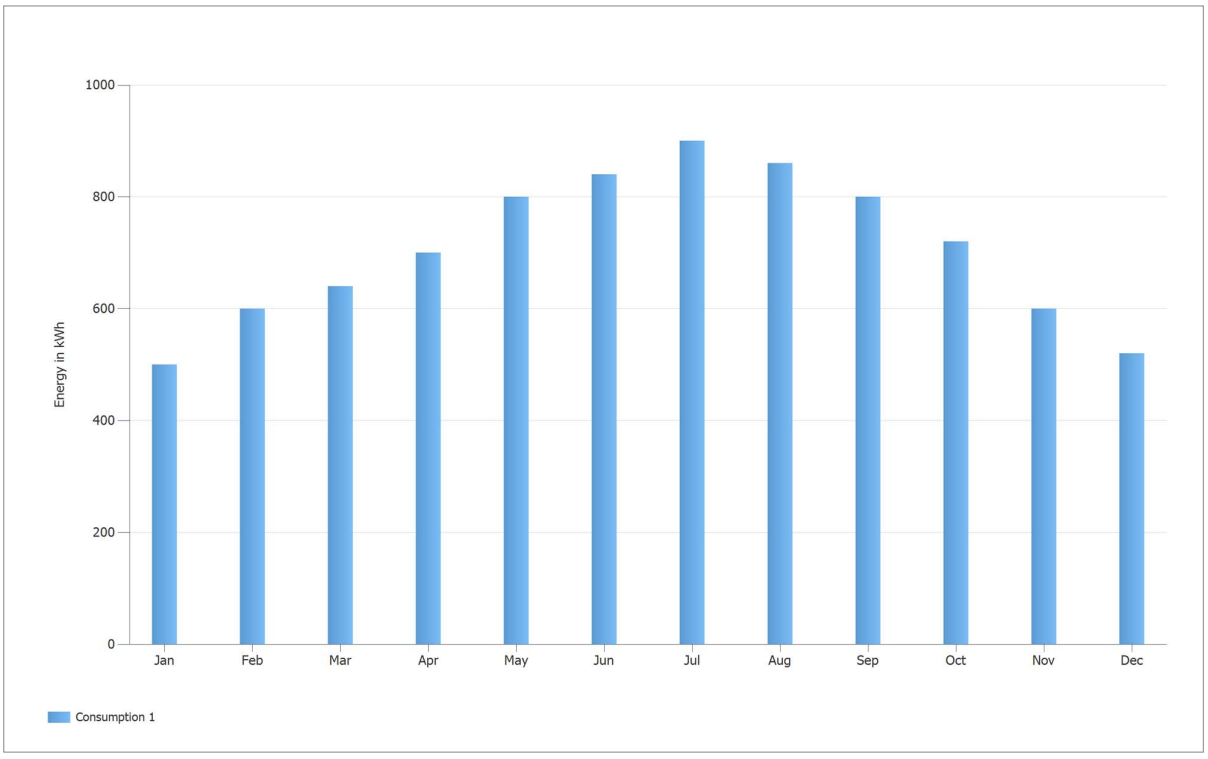


Figure: Consumption

Module Areas

1. Module Area - Moduliai

PV Generator, 1. Module Area - Moduliai

Name	Moduliai	
PV Modules	24 x TSM-415-DE09R.08 VERTEX S (v1)	
Manufacturer	Trina Solar	
Inclination	36	°
Orientation	South 180	°
Installation Type	Roof parallel	
PV Generator Surface	48,0	m²

Shading, 1. Module Area - Moduliai

Shading	0	%

Degradation of Module, 1. Module Area - Moduliai

Characteristic curve	Linear (straight line)	
Remaining power (power output) after 25 years	87	%

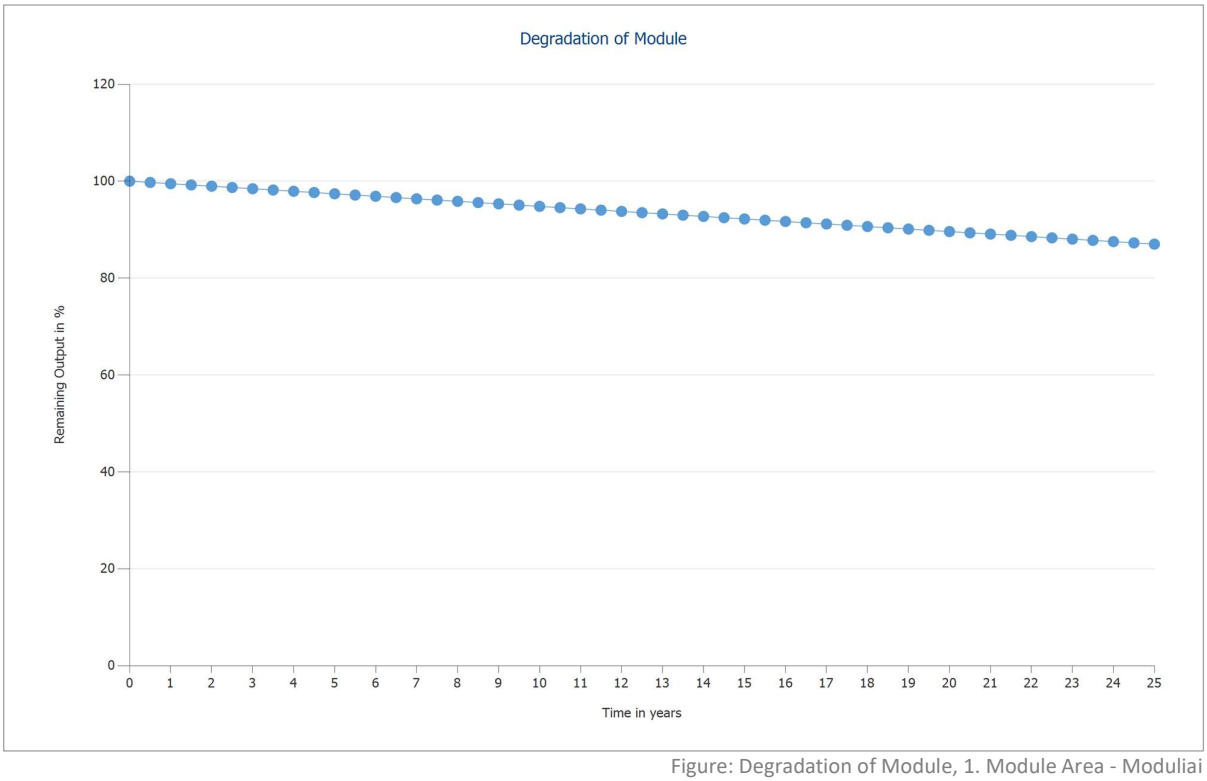


Figure: Degradation of Module, 1. Module Area - Moduliai

Inverter configuration

Configuration 1

Module Area	Moduliai
Inverter 1	
Model	MOD 10KTL3-X (v1)
Manufacturer	GROWATT New Energy Co., Ltd.
Quantity	1
Sizing Factor	99,6 %
Configuration	MPP 1: 1 x 12
	MPP 2: 1 x 12

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	9,96	kWp
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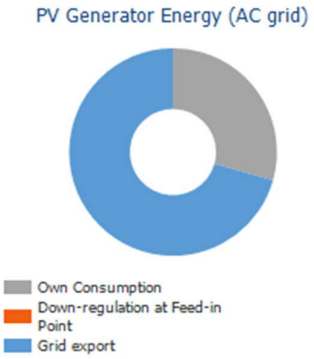
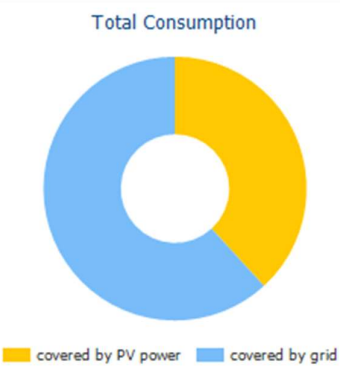


Appliances

Appliances	8 480	kWh/Year
Standby Consumption (Inverter)	10	kWh/Year
Total Consumption	8 490	kWh/Year
covered by PV power	3 242	kWh/Year
covered by grid	5 248	kWh/Year
Solar Fraction	38,2	%



Level of Self-sufficiency

Total Consumption	8 490	kWh/Year
covered by grid	5 248	kWh/Year
Level of Self-sufficiency	38,2	%

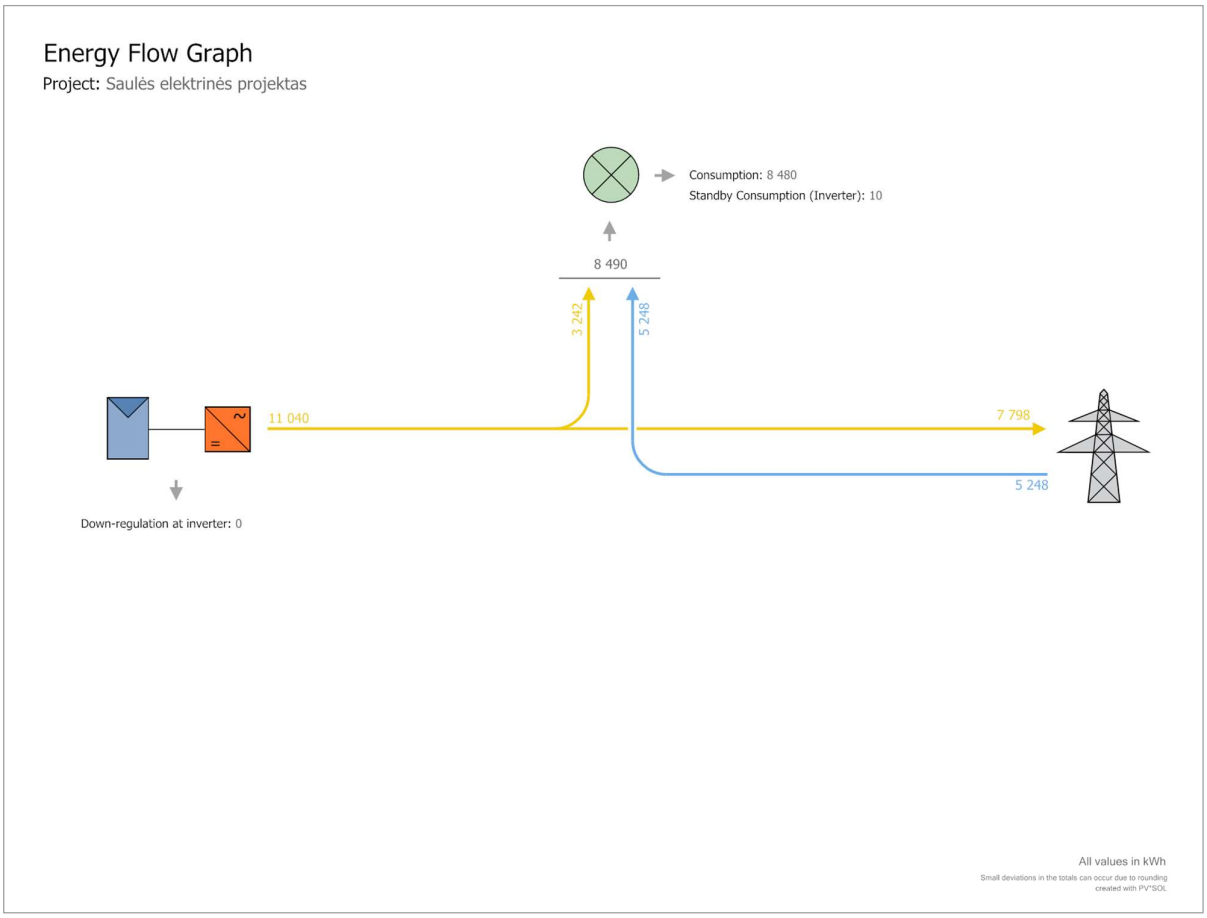


Figure: Energy flow

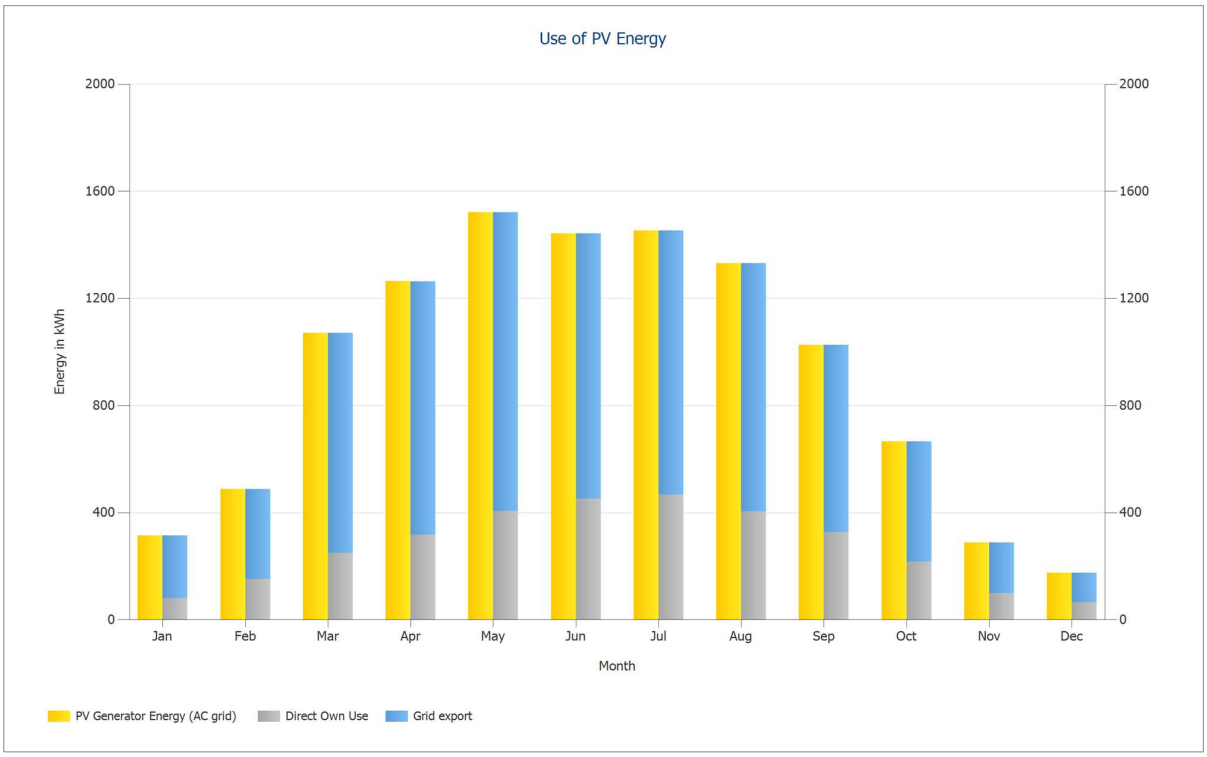


Figure: Use of PV Energy

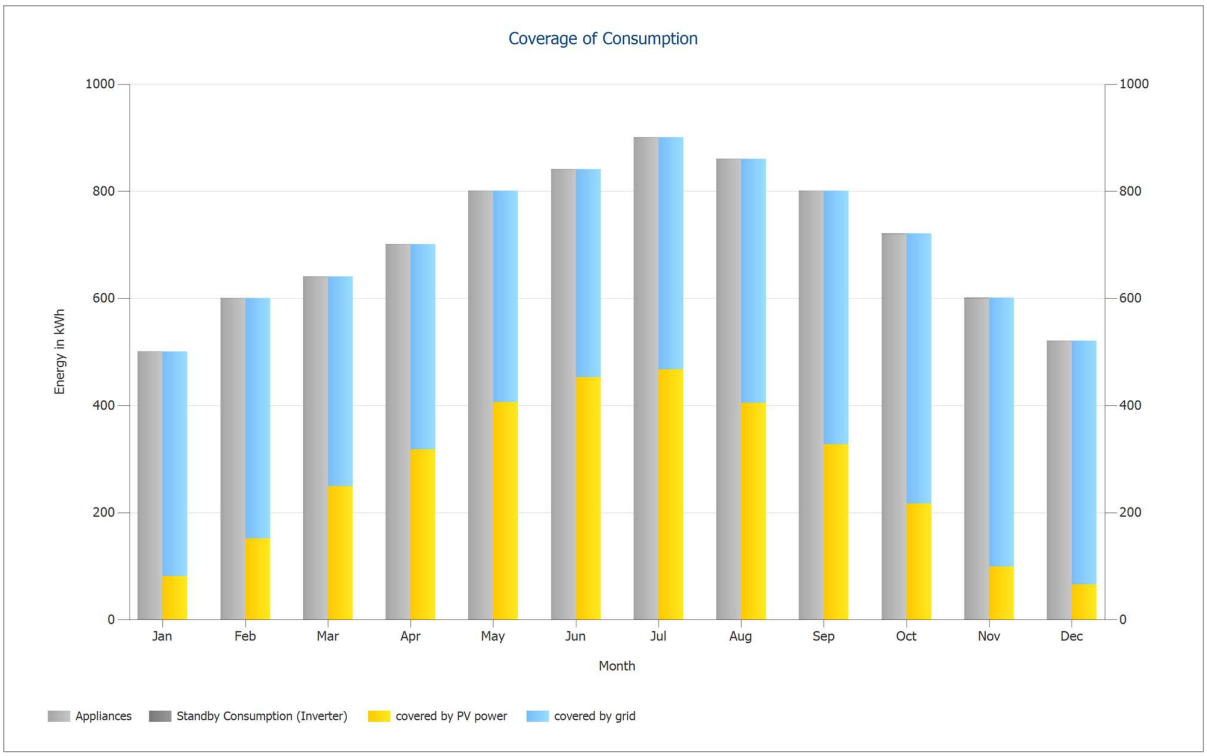


Figure: Coverage of Consumption

PV System Energy Balance

PV System Energy Balance

Global radiation - horizontal	**1 035,41**	**kWh/m²**	
Deviation from standard spectrum	-10,35	kWh/m²	-1,00 %
Ground Reflection (Albedo)	19,58	kWh/m²	1,91 %
Orientation and inclination of the module surface	150,61	kWh/m²	14,42 %
Shading	0,00	kWh/m²	0,00 %
Reflection on the Module Interface	-2,26	kWh/m²	-0,19 %
Global Radiation at the Module	**1 192,98**	**kWh/m²**	
	1 192,98	kWh/m²	
	x 47,955	m²	
	= 57 208,91	kWh	
Global PV Radiation	**57 208,91**	**kWh**	
Soiling	0,00	kWh	0,00 %
STC Conversion (Rated Efficiency of Module 20,74 %)	-45 341,20	kWh	-79,26 %
Rated PV Energy	**11 867,72**	**kWh**	
Low-light performance	5,66	kWh	0,05 %
Deviation from the nominal module temperature	-128,86	kWh	-1,09 %
Diodes	-58,72	kWh	-0,50 %
Mismatch (Manufacturer Information)	-233,72	kWh	-2,00 %
Mismatch (Configuration/Shading)	0,00	kWh	0,00 %
String Cable	-14,88	kWh	-0,13 %
PV Energy (DC) without inverter down-regulation	**11 437,19**	**kWh**	
Failing to reach the DC start output	-5,90	kWh	-0,05 %
Down-regulation on account of the MPP Voltage Range	0,00	kWh	0,00 %
Down-regulation on account of the max. DC Current	0,00	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	0,00	kWh	0,00 %
MPP Matching	-20,07	kWh	-0,18 %
PV energy (DC)	**11 411,22**	**kWh**	
Energy at the Inverter Input	**11 411,22**	**kWh**	
Input voltage deviates from rated voltage	-22,48	kWh	-0,20 %
DC/AC Conversion	-332,40	kWh	-2,92 %
Standby Consumption (Inverter)	-9,98	kWh	-0,09 %
AC cables	-16,70	kWh	-0,15 %
PV energy (AC) minus standby use	**11 029,66**	**kWh**	
PV Generator Energy (AC grid)	**11 039,64**	**kWh**	

Data Sheets

PV Module Data Sheet

PV Module: TSM-415-DE09R.08 VERTEX S (v1)

Manufacturer	Trina Solar	
Available	Yes	
Electrical Data		
Cell Type	Si monocrystalline	
Half-cell module	Yes	
Cell Count	144	
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	41,7	V
MPP Current	9,94	A
Open Circuit Voltage	50	V
Short-Circuit Current	10,55	A
Increase open circuit voltage before stabilisation	0	%
Nominal output	415	W
Fill Factor	78,58	%
Efficiency	20,74	%
I/V Part Load Characteristics		
Values source	Manufacturer/user-created	
Irradiance	200	W/m²
Voltage in MPP at Part Load	40,642	V
Current in MPP at Part Load	2,026	A
Open Circuit Voltage (Part Load)	47,06	V
Short Circuit Current at Part Load	2,11	A
Additional Parameters		
Temperature Coefficient of Voc	-125	mV/K
Temperature Coefficient of Isc	4,2	mA/K
Temperature Coefficient of Pmpp	-0,34	%/K
Incident Angle Modifier (IAM)	100	%
Maximum System Voltage	1500	V
Mechanical Data		
Width	1134	mm
Height	1762	mm
Depth	30	mm
Frame Width	30	mm
Weight	21,8	kg

Inverter Data Sheet

Inverter: MOD 10KTL3-X (v1)

Manufacturer	GROWATT New Energy Co., Ltd.	
Available	Yes	
Electrical data - DC		
DC nominal output	15	kW
Max. DC Power	15	kW
Nom. DC Voltage	580	V
Max. Input Voltage	1100	V
Max. Input Current	26	A
Max. short circuit current	26	A
Number of DC Inlets	2	
Electrical data - AC		
AC Power Rating	10	kW
Max. AC Power	11	kVA
Nom. AC Voltage	230	V
Number of Phases	3	
With Transformer	No	
Electrical data - other		
Change in Efficiency when Input Voltage deviates from Rated Voltage	0,2	%/100V
Min. Feed-in Power	50	W
Standby Consumption	5	W
Night Consumption	1	W
MPP Tracker		
Output Range < 20% of Power Rating	99,5	%
Output Range > 20% of Power Rating	99,9	%
Count of MPP Trackers	2	
MPP Tracker 1-2		
Max. Input Current	13	A
Max. short circuit current	13	A
Max. Input Power	9	kW
Min. MPP Voltage	200	V
Max. MPP Voltage	1100	V

Plans and parts list

Circuit Diagram

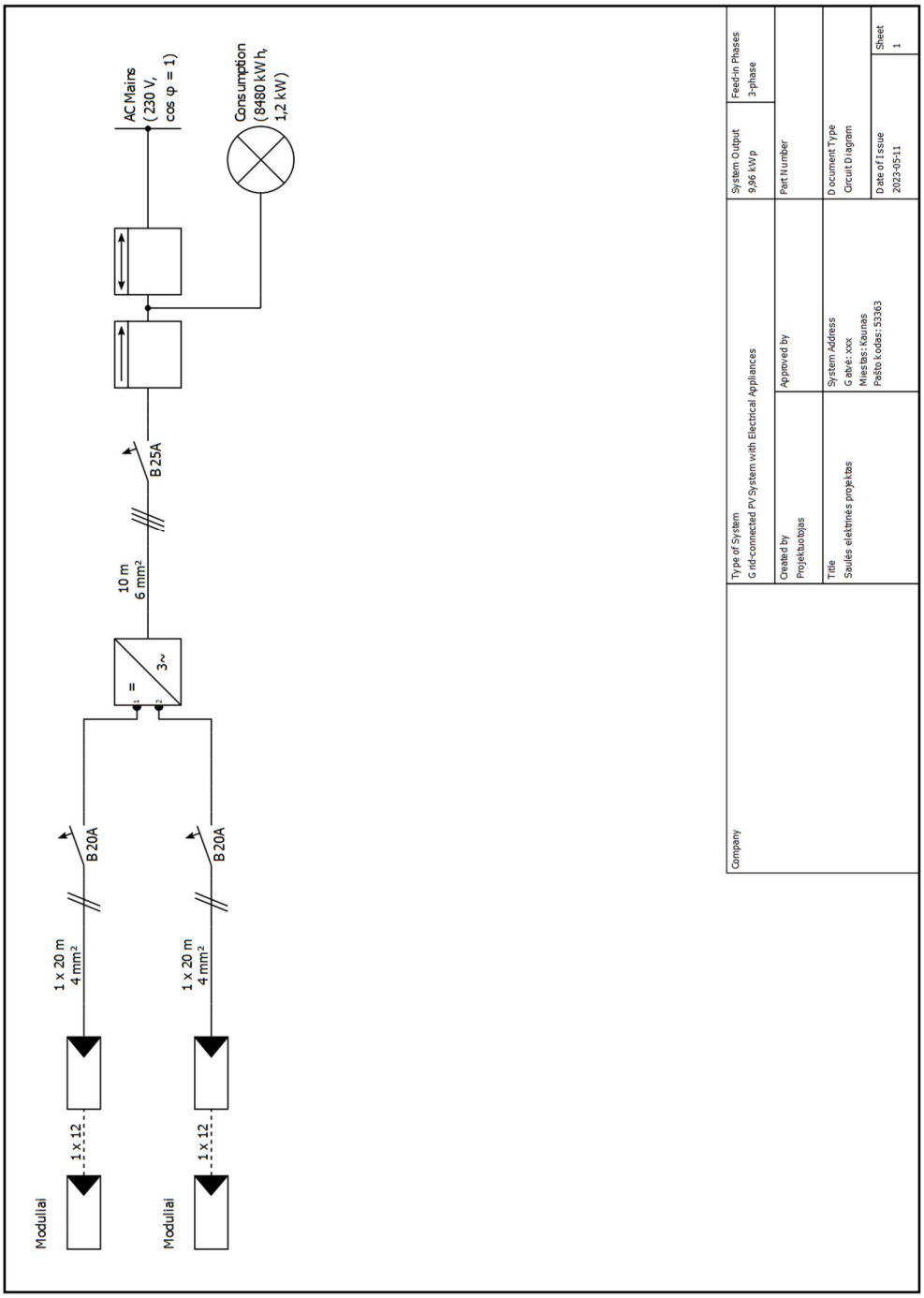


Figure: Circuit Diagram