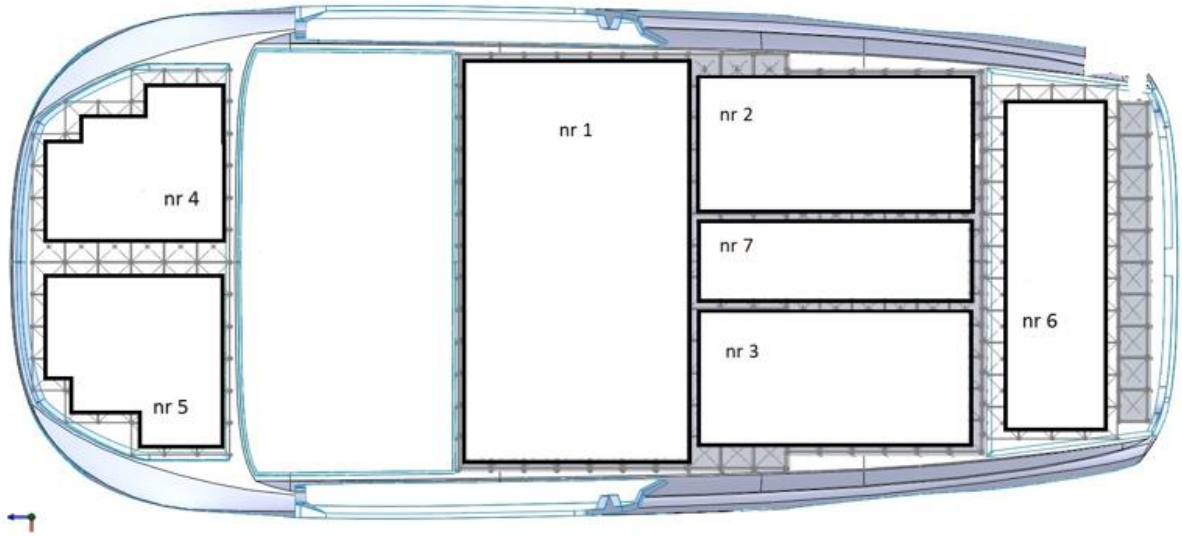
Technical documentation of photovoltaic panels

1) Design of the area intended for the installation of photovoltaic panels with dimensions.



2) Models of the photovoltaic panels used with their cost estimate.

- The vehicle will be fitted with Solbian panels with the following models:

Panels number 4, 5: Solbian SP 97

Panel number 6: Solbian SP 144

Panel number 1: Sunport

Panel number 7: Solbian SP 52L

Panel number 2: Solbian SP 100

Panel number 3: Sungold

3) Parameters of the panels used, the way of their connection and division.

Panel	Max power [Wp]	Rated voltage [Vmp]	Voltage [Voc]	Current [A]	Dimensions [mm]	Mass [kg]	Thickness [mm]	Location	Number of cells
Solbian SP 144	144	25,3	30	5,7	1490*546	1,9	2	Car trunk	44
Solbian SP 97	97	17 - 17,2	20,5 - 20,7	5,7	850*783	-	2	Hood	30
Solbian SP 97	97	17 - 17,2	20,5 - 20,7	5,7	850*783	-	2	Hood	30
Solbian SP 100	102	18	21,8	5,7	1109*546	1,5	2	Rear window	32
Sungold	100	17,6	20,8	5,68	1200*560	-	3	Rear window	32
Solbian SP 52L	52	9,1	10,9	5,7	1109*292	0,8	2	Rear window	16
Sunport	315	33	40,1	9,55	1660*990	4	1,4	Roof	60

Datasheet

	SP 144	SP 130	SP 118 L	SP 118 Q	SP 104	SP 78	SP 52 L	SP 52 Q
Maximum power (±5%) [W]	144	130	118	118	104	78	52	52
Length Y [mm]	1490	1363	1236	855	1109	855	1109	601
Width X [mm]	546	546	546	800	546	546	292	546
Thickness [mm]	2	2	2	2	2	2	2	2
Weight [kg]	1.90	1.70	1.60	1.60	1.40	1.10	0.80	0.80
Max power Voltage Vmp [V]	25.3	22.8	20.7	20.7	18.2	13.7	9.1	9.1
Max power Current Imp [A]	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Open circuit voltage Voc [V]	30.0	27.3	24.5	24.5	21.8	16.4	10.9	10.9
Short circuit current Isc [A]	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
NOCT [°C]	45 ± 2	45 ± 2	45 ± 2	45 ± 2	45 ± 2	45 ± 2	45 ± 2	45 ± 2
Operating temperature [°C]	-40/+85	-40/+85	-40/+85	-40/+85	-40/+85	-40/+85	-40/+85	-40/+85
Temp. coeff. Pmax [%/°C]	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35
Temp. coeff. Voc [%/°C]	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28
Temp. coeff. Isc [%/°C]	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Columns x Rows (cells n°)	4x11 (44)	4x10 (40)	4x9 (36)	6x6 (36)	4x8 (32)	4x6 (24)	2x8 (16)	4x4 (16)
Maximum system voltage [V]	1000 V	1000 V	1000 V	1000 V	1000 V	1000 V	1000 V	1000 V
Maximum reverse current [A]	12 A	12 A	12 A	12 A	12 A	12 A	12 A	12 A
Safety class	A	A	A	A	A	A	A	A

* Values at STC = Standard Test Conditions: (a) light Spectrum for an Air Mass of 1.5; (b) irradiance of 1000 W/m² with perpendicular incidence and (c) cell temperature of 25 °C. Measurements carried out according to the Standard IEC 61215 requirements.

For SP 100 :

Specification

Specyfikacja

Moc szczytowa (+/- 5%) - Pmax	102 W
Napięcie znamionowe — Vmp	18,0 V
Prąd znamionowy - Imp	5,7
Napięcie w obwodzie otwartym - Voc	21,8 V
Prąd zwarciowy - Isc	6 lat
Temp. współcz. Pmax	-0,38%/°C
Temp. współcz. Voc	-0,27%/°C
Temp. współcz. Isc	0,05%/°C
Długość	43,66" (1109 mm)
Szerokość	21,50" (546 mm)
Grubość	0,079" (2 mm)
Waga	3,3 funta (1,5 kg)
Liczba komórek	32

Peak power (+/- 5%) – Pmax	102 W
Rated voltage - Vmp	18,0 V
Rated current - Imp	5,7
Open circuit voltage - Voc	21,8 V
Short-circuit current	6 lat
Temp. coeff. Pmax	-0,38%/˚C
Temp. coeff. Voc	-0,27%/˚C
Temp. coeff. Isc	0,05%/˚C
Lenght	43,66” (1109 mm)
Width	21,50” (546 mm)
Thickness	0,079” (2 mm)
Mass	3,3 pounds (1,5 kg)
Number of cells	32

The panels will be divided into three groups, in each of them the cells will be connected in series so that each group of panels has a system voltage within the range of 45-85 [V]. The current of the entire system will not exceed the threshold of 10 [A].

4) Cell area calculations

Dimensions of cells:

Solbian (in every model) – square 125x125 mm

Sunport – square 159x159 mm

Sungold – square 125x125 mm

Solbian cell area = 125*125 = 15625 mm^2

Sunport cel area = 159*159 = 25281 mm^2

Sungold cel area = 125*125 = 15625 mm^2

Total cel area = (44 + 30 + 30 + 32 + 16)*15625 + 60*25281 + 32*15625 =

= 2375000 + 1516860 + 500000 =

= 4391860 mm^2 = **4,391860 m^2**