

## 5. SCHEME

A **10.14 kWp** PV System comprising of 31 panels, generating **9,425.00 kWh/annum** saving **5,614.00 kg CO<sub>2</sub>/annum**

SunPower mono-crystalline solar modules in maximum power of 327Wp are produced with a state of the art robotic production line. These modules are suitable for use in most electrical power applications and have excellent durability to prevailing weather conditions.

### FEATURES

- 96 High efficiency cells ensure high performance of the solar module and create more power under the same conditions.
- overall panel efficiency is 20.1%
- High transmission tempered glass with anti-reflective (AR) coating
- 3 Bypass diodes minimise the power drop caused by shade.
- Improved back contact technology – MAXEON™ CELL TECHNOLOGY
- Output terminals have waterproof MC4 connectors.
- Produced under systematic quality control covering all processes and factors.

### **5.1. Performance Estimates of the PV System**

The performance of solar PV systems is impossible to predict with certainty due to the variability in the amount of solar radiation (sunlight) from location to location and from year to year. This estimate is based upon the Guide to the installation of PV systems 2012 and is given as guidance only. It should not be considered as a guarantee of performance.

Note: The two estimates given below are determined in two different ways. The Guide to The Installations of PV Systems 2012 uses UK weather data, angle of inclination, direction of the panels and shading. This is the approved MCS012 method of yield estimation. PV\*SOL is the industry standard software which in addition to the above takes into account manufacturer's data of the actual PV Panels and inverters used. We find this tends to give a more accurate estimate of system performance, however the result should be treated with caution if it is significantly greater than the result given by the standard MCS012 method. Contact us for any queries relating to these figures

POWER GENERATED (kWh/yr):

REDUCTION IN CO2 EMISSIONS (kg/yr):

<b>PV*SOLr7.5</b>	<b>Guide to the installation of PV systems 2012</b>
9,425.00 kWh/yr	9,085.44 kWh/yr
5,1604.00 kg/yr	4,806.20 kg/yr

### Photovoltaic Yield Calculator

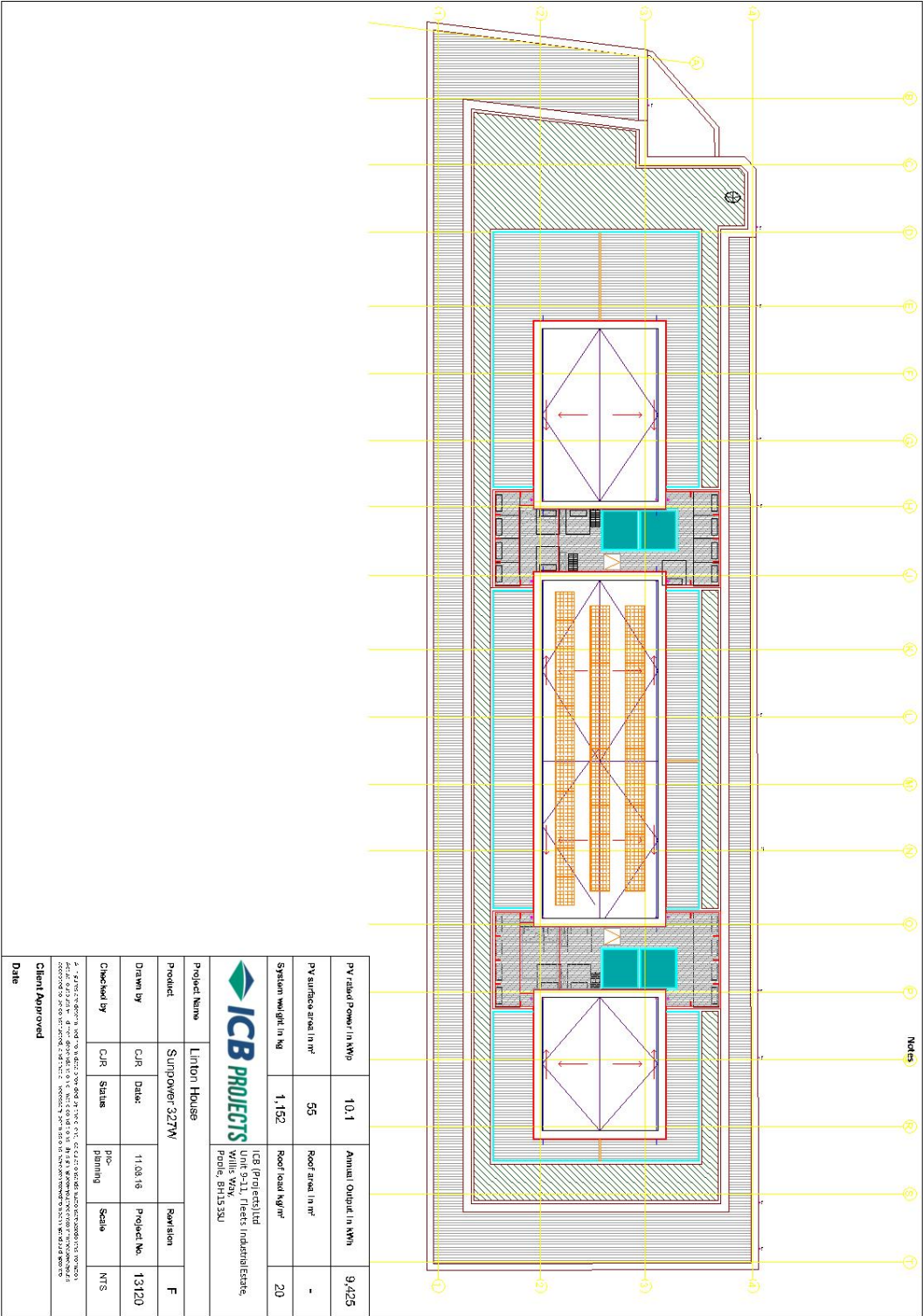
To MIS 3002 Issue 3.1 / Guide to installation of photovoltaic panels

Annual AC Output (kWh) = kWp x Kk x SF

Rating of PV System	10.14 kWp
Project Postcode	NW
Zone	1
Array Pitch (Degrees from Horizontal)	10 °
Array Orientation (Degrees from South)	0 °
kWh/kWp (Kk)	896
Shading Factor	1.00
Has a site survey been completed?	Yes
Annual AC Output	9085.44 kWh/annum

**Note:** The performance of solar PV systems is impossible to predict with certainty due to the variability in the amount of solar radiation (sunlight) from location to location and from year to year. This estimate is based upon the standard MCS procedure and is given as a guidance only. It should not be considered as a guarantee of performance.

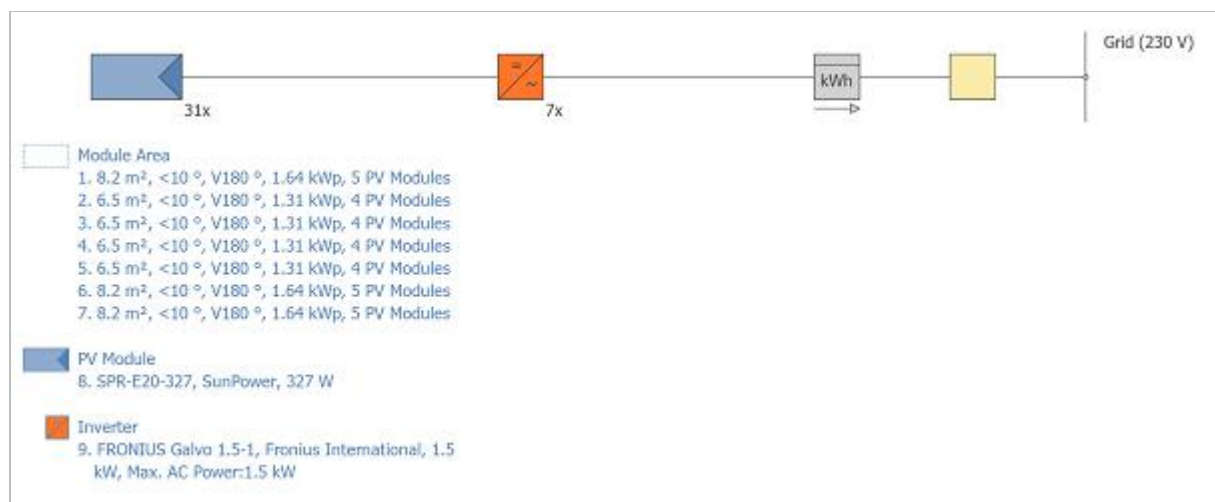
5.2. PV Layout



### 5.3. Calculations and Shading

#### Grid Connected PV System

Climate Data	Thames (SAP 2012) ( - )
PV Generator Output	10.16 kWp
PV Generator Surface	50.6 m <sup>2</sup>
Number of PV Modules	31
Number of Inverters	7



#### The yield

PV Generator Energy (AC grid)	9,425 kWh
Spec. Annual Yield	927.64 kWh/kWp
Performance Ratio (PR)	87.0 %
CO <sub>2</sub> Emissions avoided	5,614 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

Climate Data Thames (SAP 2012)  
 Type of System Grid Connected PV System

### PV Generator 1. Module Area

Name	Flat 501
PV Modules*	5 x SPR-E20-327
Manufacturer	SunPower
Inclination	10 °
Orientation	South 180 °
Installation Type	Mounted - Roof
PV Generator Surface	8.2 m <sup>2</sup>

### Losses

Shading	0 %
Remaining power (performance output) after 20 years	90 %

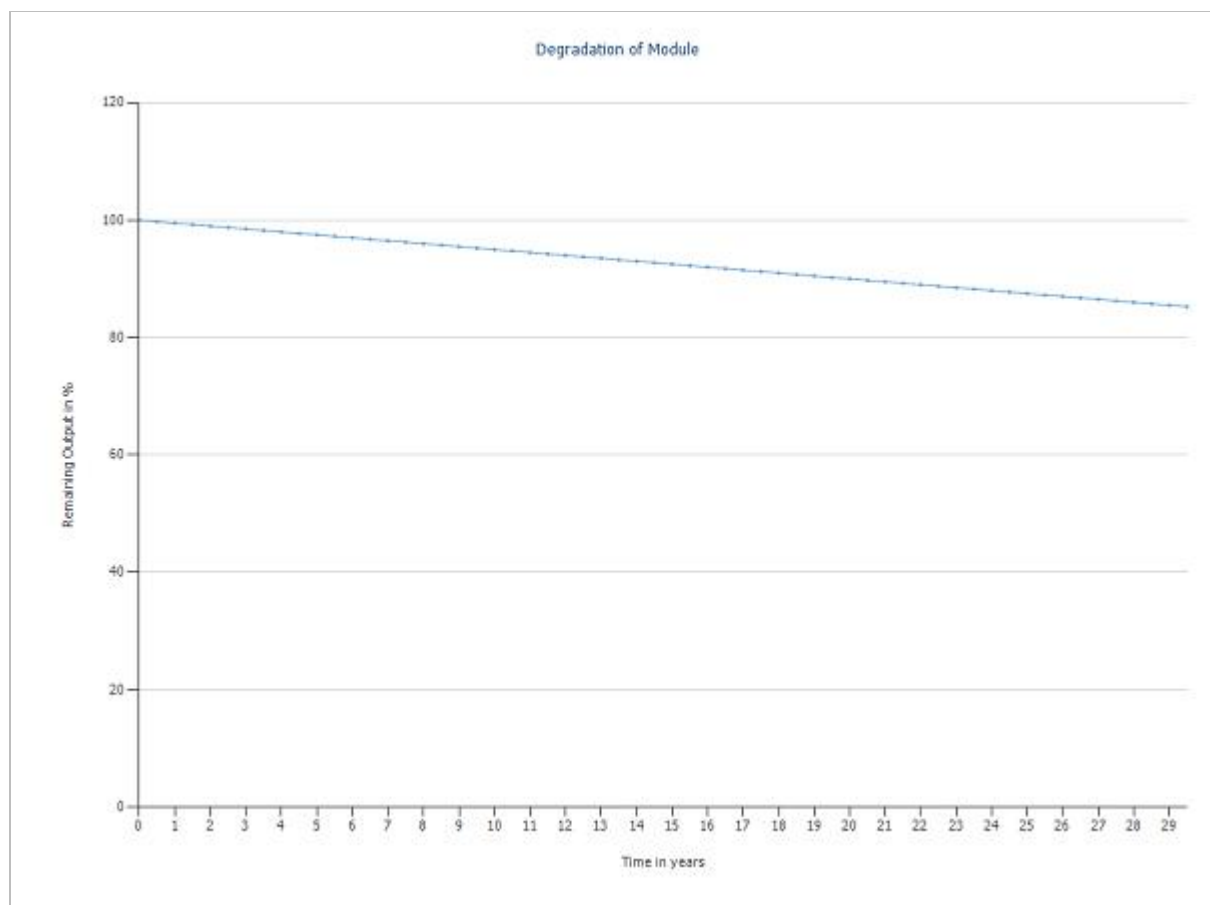


Figure: Degradation of Module for Flat 501

#### PV Generator 2. Module Area

Name	Flat 502
PV Modules*	4 x SPR-E20-327
Manufacturer	SunPower
Inclination	10 °
Orientation	South 180 °
Installation Type	Mounted - Roof
PV Generator Surface	6.5 m <sup>2</sup>

#### Losses

Shading	0 %
Remaining power (performance output) after 20 years	90 %

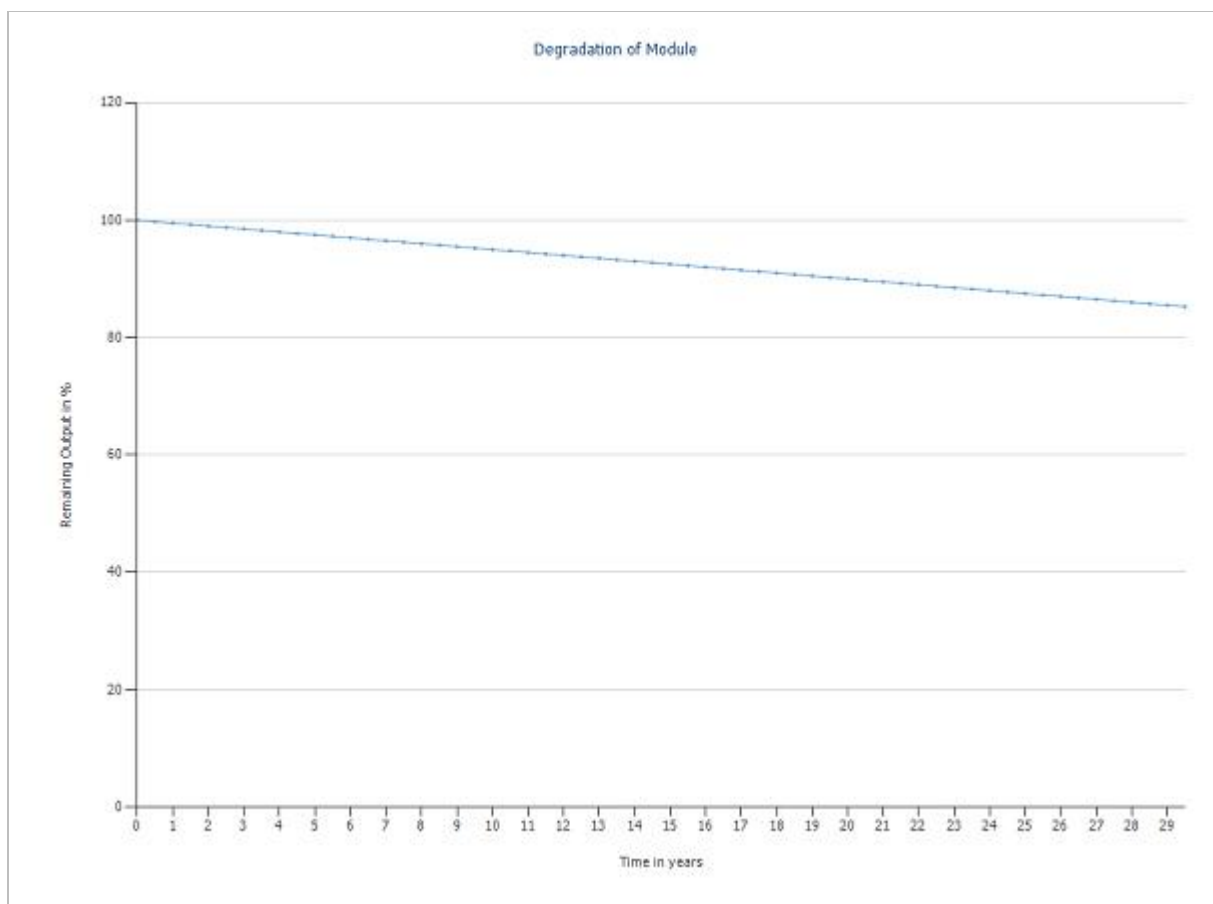


Figure: Degradation of Module for Flat 502

#### PV Generator 3. Module Area

Name	Flat 503
PV Modules*	4 x SPR-E20-327
Manufacturer	SunPower
Inclination	10 °
Orientation	South 180 °
Installation Type	Mounted - Roof
PV Generator Surface	6.5 m <sup>2</sup>

#### Losses

Shading	0 %
Remaining power (performance output) after 20 years	90 %

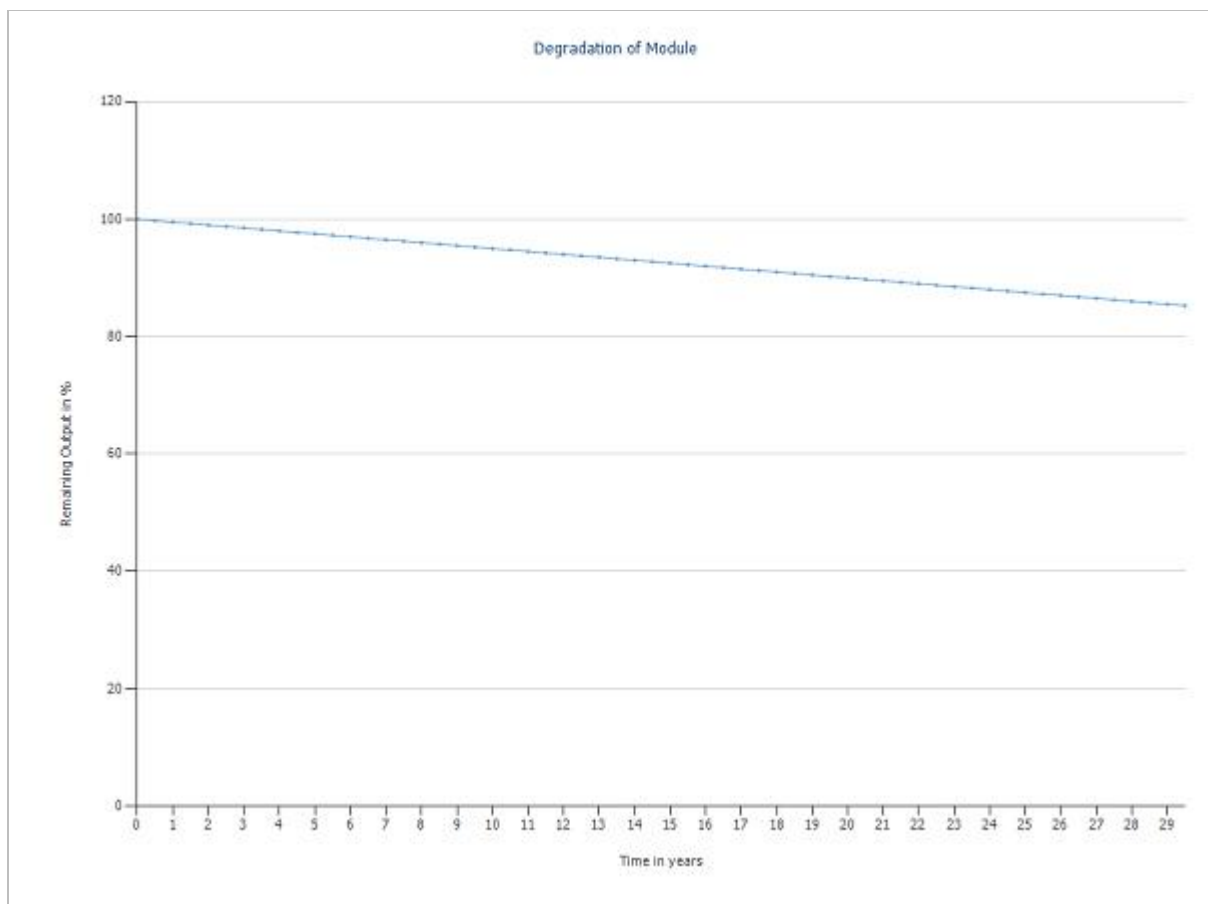


Figure: Degradation of Module for Flat 503

#### PV Generator 4. Module Area

Name	Flat 504
PV Modules*	4 x SPR-E20-327
Manufacturer	SunPower
Inclination	10 °
Orientation	South 180 °
Installation Type	Mounted - Roof
PV Generator Surface	6.5 m <sup>2</sup>

#### Losses

Shading	0 %
Remaining power (performance output) after 20 years	90 %



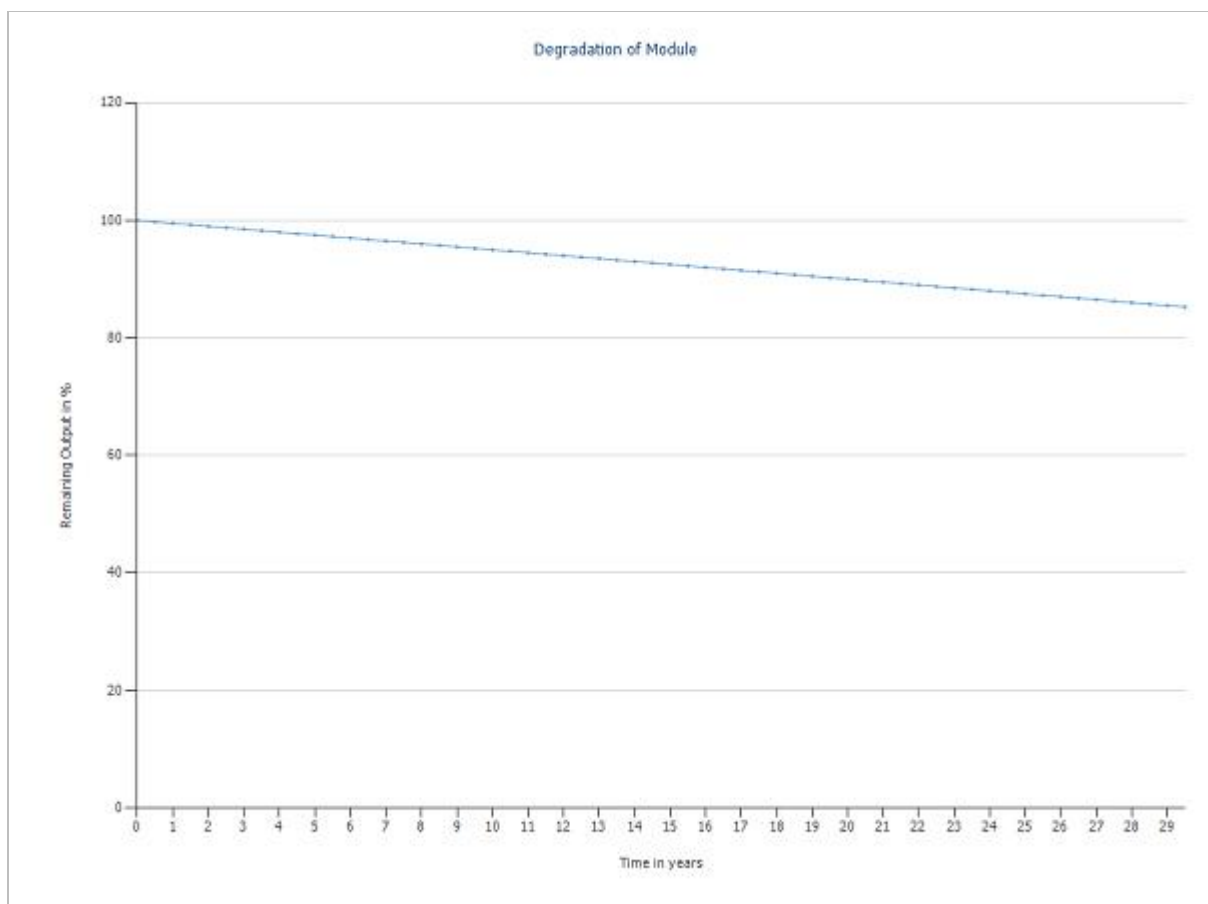


Figure: Degradation of Module for Flat 504

#### PV Generator 5. Module Area

Name	Flat 505
PV Modules*	4 x SPR-E20-327
Manufacturer	SunPower
Inclination	10 °
Orientation	South 180 °
Installation Type	Mounted - Roof
PV Generator Surface	6.5 m <sup>2</sup>

#### Losses

Shading	0 %
Remaining power (performance output) after 20 years	90 %

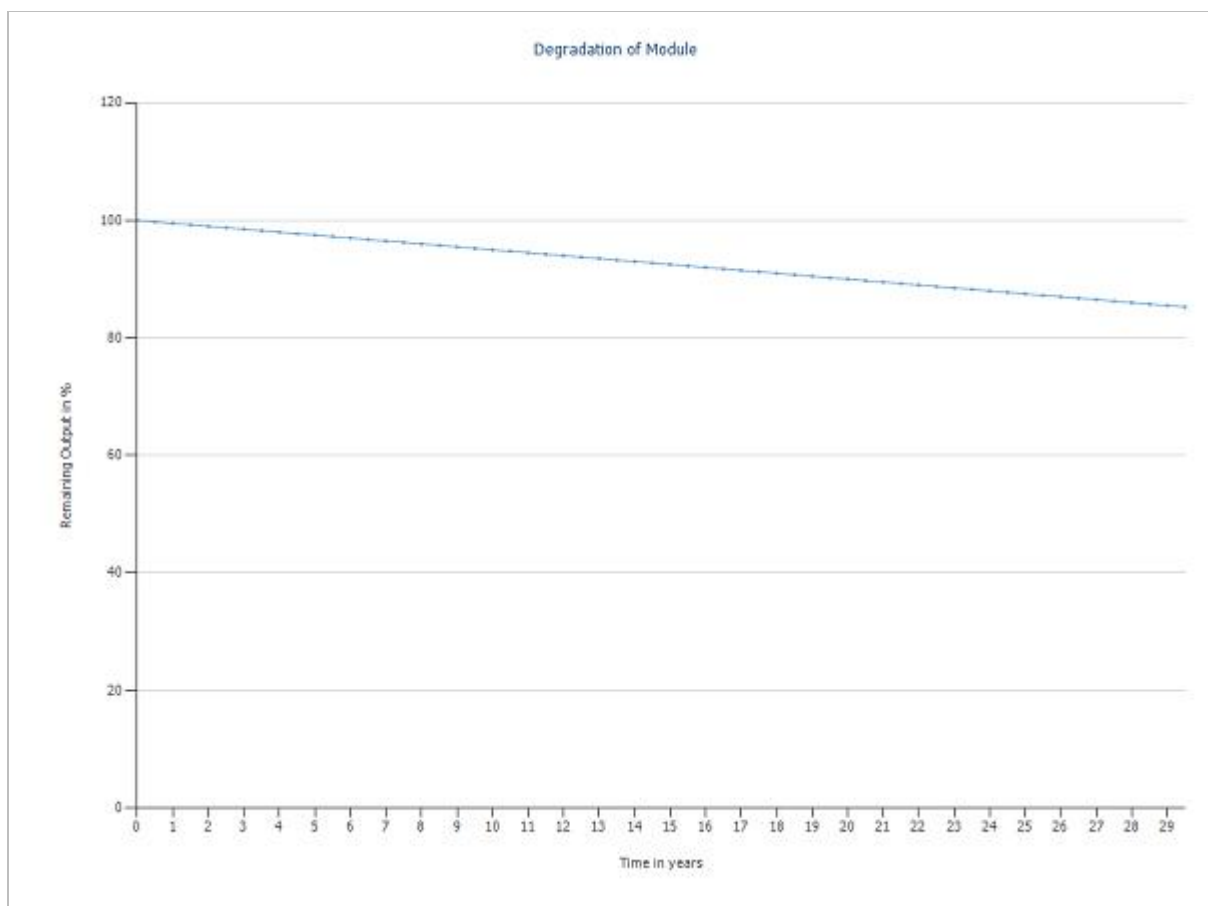


Figure: Degradation of Module for Flat 505

#### PV Generator 6. Module Area

Name	Flat 506
PV Modules*	5 x SPR-E20-327
Manufacturer	SunPower
Inclination	10 °
Orientation	South 180 °
Installation Type	Mounted - Roof
PV Generator Surface	8.2 m²

#### Losses

Shading	0 %
Remaining power (performance output) after 20 years	90 %

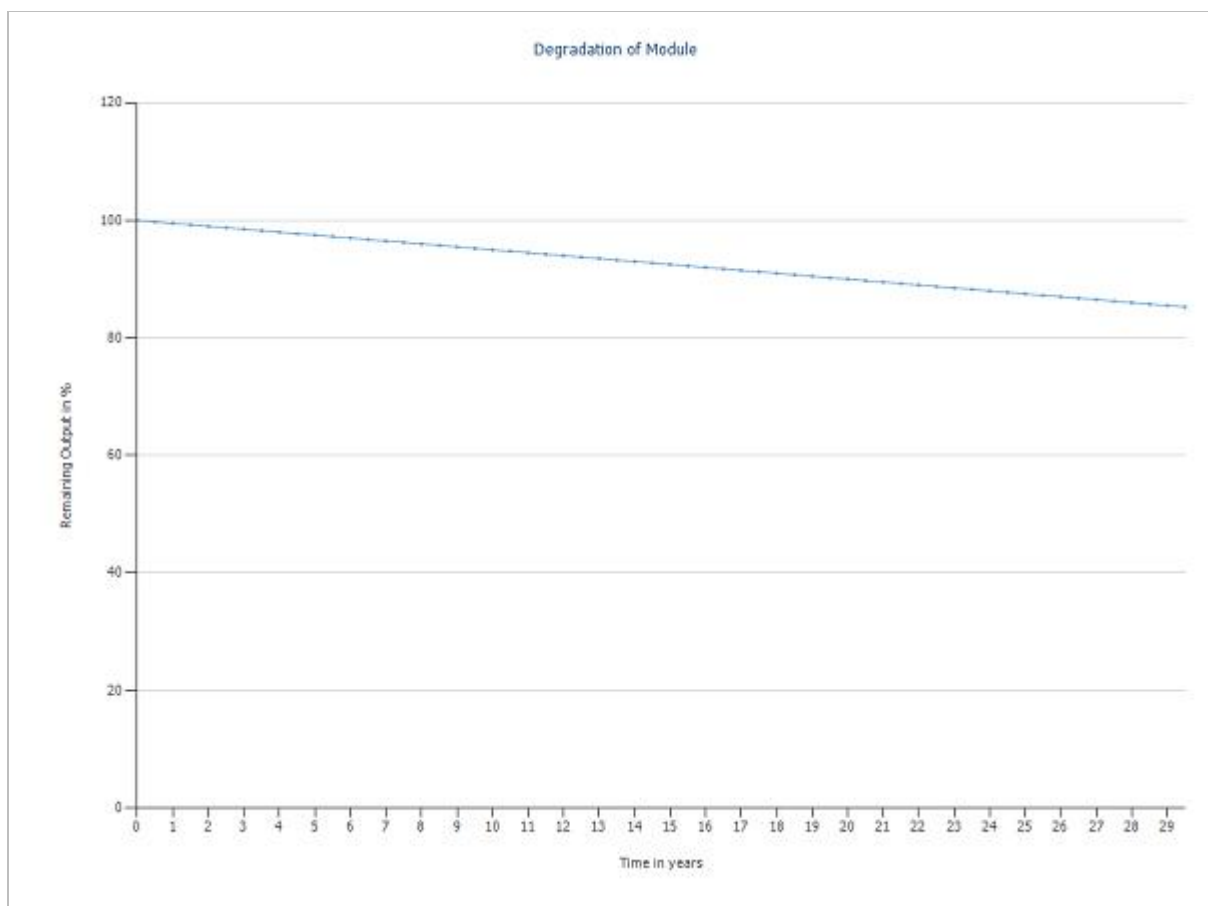


Figure: Degradation of Module for Flat 506

#### PV Generator 7. Module Area

Name	Flat 507
PV Modules*	5 x SPR-E20-327
Manufacturer	SunPower
Inclination	10 °
Orientation	South 180 °
Installation Type	Mounted - Roof
PV Generator Surface	8.2 m²

#### Losses

Shading	0 %
Remaining power (performance output) after 20 years	90 %

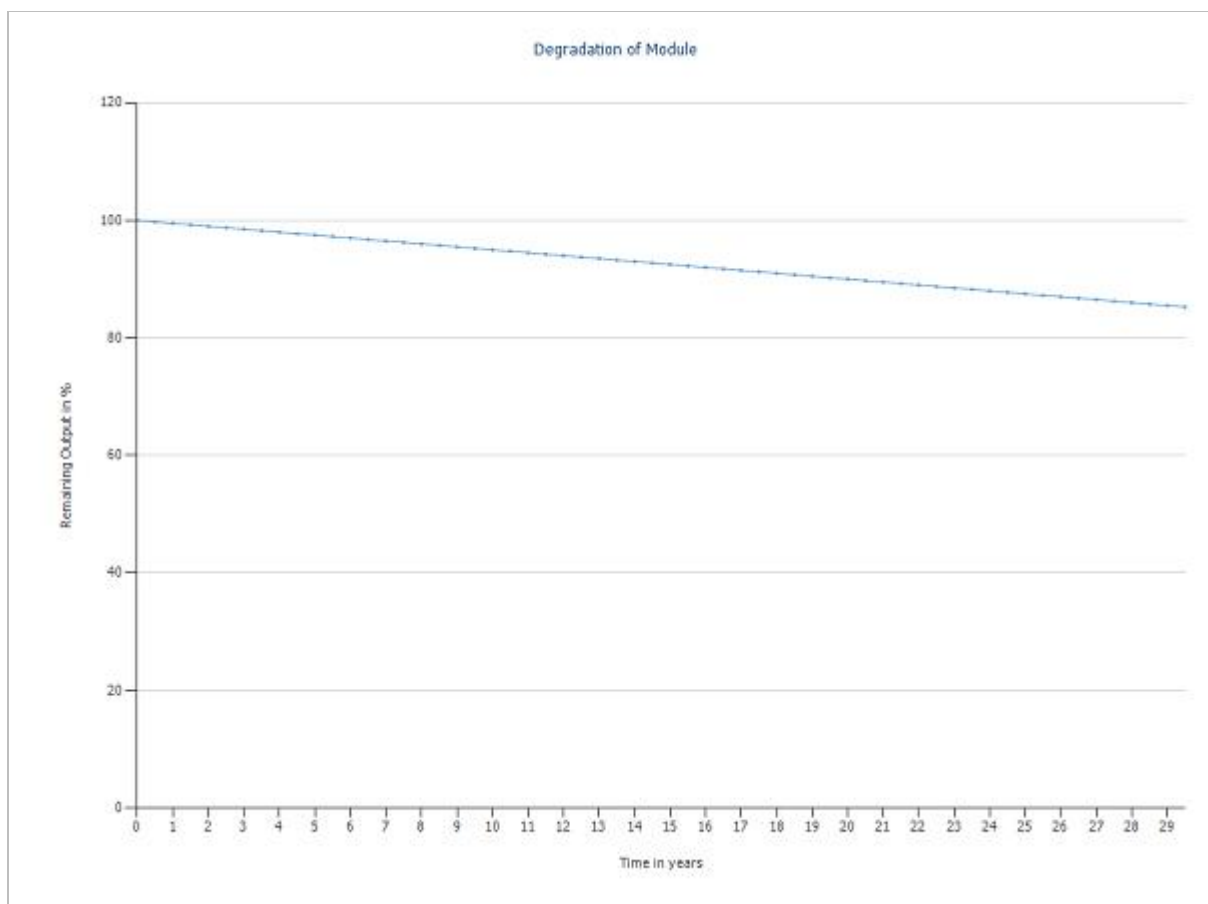


Figure: Degradation of Module for Flat 507

## Inverter

### 1. Module Area

Inverter 1\*

Manufacturer

Configuration

### Flat 501

1 x FRONIUS Galvo 1.5-1

Fronius International

MPP 1: 1 x 5

### 2. Module Area

Inverter 1\*

Manufacturer

Configuration

### Flat 502

1 x FRONIUS Galvo 1.5-1

Fronius International

MPP 1: 1 x 4

### 3. Module Area

Inverter 1\*

Manufacturer

Configuration

### Flat 503

1 x FRONIUS Galvo 1.5-1

Fronius International

MPP 1: 1 x 4

### 4. Module Area

Inverter 1\*

Manufacturer

Configuration

### Flat 504

1 x FRONIUS Galvo 1.5-1

Fronius International

MPP 1: 1 x 4

#### 5. Module Area

Inverter 1*	<b>Flat 505</b>
Manufacturer	1 x FRONIUS Galvo 1.5-1 Fronius International
Configuration	MPP 1: 1 x 4

#### 6. Module Area

Inverter 1*	<b>Flat 506</b>
Manufacturer	1 x FRONIUS Galvo 1.5-1 Fronius International
Configuration	MPP 1: 1 x 5

#### 7. Module Area

Inverter 1*	<b>Flat 507</b>
Manufacturer	1 x FRONIUS Galvo 1.5-1 Fronius International
Configuration	MPP 1: 1 x 5

#### AC Mains

Number of Phases	3
Mains Voltage (1-phase)	230 V
Displacement Power Factor (cos phi)	+/- 1

#### Cable

Max. Total Loss	0.6 %
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\* The guarantee provisions of the respective manufacturer apply

## Simulation Results

### PV System

PV Generator Output	10.2 kWp
Spec. Annual Yield	927.64 kWh/kWp
Performance Ratio (PR)	87.0 %

Grid Feed-in	9,425 kWh/year
Grid Feed-in in the first year (incl. module degradation)	9,394 kWh/year
Stand-by Consumption	69 kWh/year
CO <sub>2</sub> Emissions avoided	5,614 kg / year

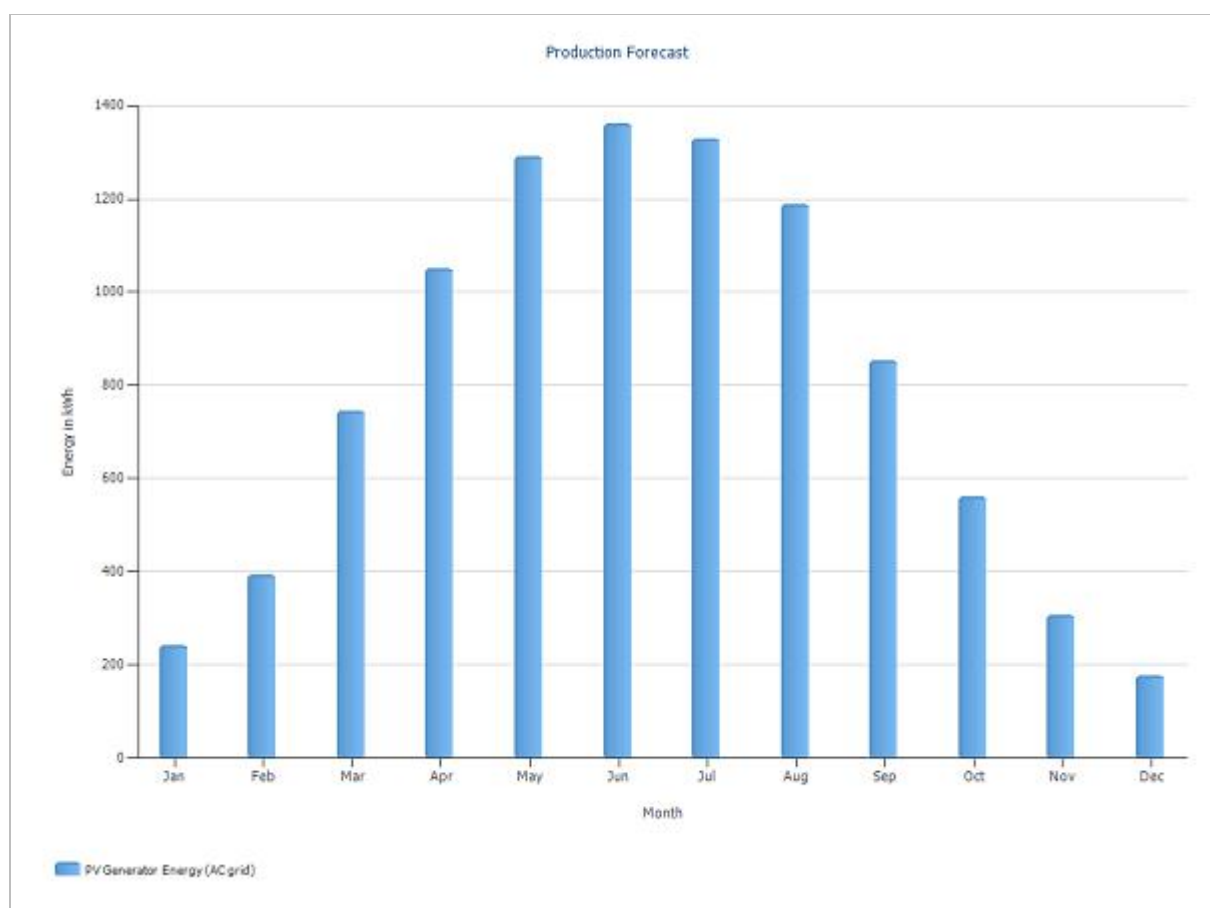


Figure: Production Forecast

#### Results per Module Area

##### Flat 501

PV Generator Output	1.64 kWp
PV Generator Surface	8.2 m <sup>2</sup>
Global Radiation at the Module	1068.2 kWh/m <sup>2</sup>
PV Generator Energy (AC grid)	1530.2 kWh/year
Spec. Annual Yield	933.1 kWh/kWp
Performance Ratio (PR)	87.6 %

##### Flat 502

PV Generator Output	1.31 kWp
PV Generator Surface	6.5 m <sup>2</sup>
Global Radiation at the Module	1068.2 kWh/m <sup>2</sup>
PV Generator Energy (AC grid)	1208.5 kWh/year
Spec. Annual Yield	922.5 kWh/kWp
Performance Ratio (PR)	86.5 %

##### Flat 503

PV Generator Output	1.31 kWp
PV Generator Surface	6.5 m <sup>2</sup>
Global Radiation at the Module	1068.2 kWh/m <sup>2</sup>
PV Generator Energy (AC grid)	1208.5 kWh/year
Spec. Annual Yield	922.5 kWh/kWp
Performance Ratio (PR)	86.5 %

##### Flat 504

PV Generator Output	1.31 kWp
PV Generator Surface	6.5 m <sup>2</sup>
Global Radiation at the Module	1068.2 kWh/m <sup>2</sup>
PV Generator Energy (AC grid)	1208.5 kWh/year
Spec. Annual Yield	922.5 kWh/kWp
Performance Ratio (PR)	86.5 %

##### Flat 505

PV Generator Output	1.31 kWp
PV Generator Surface	6.5 m <sup>2</sup>
Global Radiation at the Module	1068.2 kWh/m <sup>2</sup>
PV Generator Energy (AC grid)	1208.5 kWh/year
Spec. Annual Yield	922.5 kWh/kWp
Performance Ratio (PR)	86.5 %

##### Flat 506

PV Generator Output	1.64 kWp
PV Generator Surface	8.2 m <sup>2</sup>
Global Radiation at the Module	1068.2 kWh/m <sup>2</sup>
PV Generator Energy (AC grid)	1530.2 kWh/year
Spec. Annual Yield	933.1 kWh/kWp
Performance Ratio (PR)	87.6 %

## PV System Energy Balance

<b>Global radiation - horizontal</b>	<b>1,010.8 kWh/m<sup>2</sup></b>	
Deviation from standard spectrum	-10.11 kWh/m <sup>2</sup>	-1.00 %
Orientation and inclination of the module surface	67.48 kWh/m <sup>2</sup>	6.74 %
Shading	0.00 kWh/m <sup>2</sup>	0.00 %
Reflection on the Module Interface	0.00 kWh/m <sup>2</sup>	0.00 %
<b>Global Radiation at the Module</b>	<b>1,068.2 kWh/m<sup>2</sup></b>	

$$\begin{aligned}
 &1,068.2 \text{ kWh/m}^2 \\
 &\times 50.55 \text{ m}^2 \\
 &= 54,000.3 \text{ kWh}
 \end{aligned}$$

<b>Global PV Radiation</b>	<b>54,000.3 kWh</b>	
Soiling	0.00 kWh	0.00 %
STC Conversion (Rated Efficiency of Module 20.06 %)	-43,168.32 kWh	-79.94 %
<b>Rated PV Energy</b>	<b>10,831.9 kWh</b>	
Low-light performance	-302.79 kWh	-2.80 %
Deviation from the nominal module temperature	-96.75 kWh	-0.92 %
Diodes	-52.16 kWh	-0.50 %
Mismatch (Manufacturer Information)	-207.60 kWh	-2.00 %
Mismatch (Configuration/Shading)	0.00 kWh	0.00 %
String Cable	-26.00 kWh	-0.26 %
<b>PV Energy (DC) without inverter regulation</b>	<b>10,146.6 kWh</b>	
Regulation on account of the MPP Voltage Range	-0.01 kWh	0.00 %
Regulation on account of the max. DC Current	0.00 kWh	0.00 %
Regulation on account of the max. DC Power	0.00 kWh	0.00 %
Regulation on account of the max. AC Power/cos phi	0.00 kWh	0.00 %
MPP Matching	-1.70 kWh	-0.02 %
<b>PV energy (DC)</b>	<b>10,144.9 kWh</b>	

<b>Energy at the Inverter Input</b>	<b>10,144.9 kWh</b>	
Input voltage deviates from rated voltage	-18.63 kWh	-0.18 %
DC/AC Conversion	-697.81 kWh	-6.89 %
Stand-by Consumption	-68.73 kWh	-0.73 %
AC Cable	-3.66 kWh	-0.04 %
<b>PV energy (AC) minus standby use</b>	<b>9,356.1 kWh</b>	
<b>Grid Feed-in</b>	<b>9,424.8 kWh</b>	



#### PV Module: SPR-E20-327

Manufacturer	SunPower
Available	Yes

#### Electrical Data

Cell Type	Si monocrystalline
Only Transformer Inverters suitable	No
Number of Cells	96
Number of Bypass Diodes	3

#### Mechanical Data

Width	1046 mm
Height	1559 mm
Depth	46 mm
Frame Width	7 mm
Weight	18.6 kg
Framed	No

#### I/V Characteristics at STC

MPP Voltage	54.7 V
MPP Current	5.98 A
Power Rating	327 W
Open Circuit Voltage	64.9 V
Short-Circuit Current	6.46 A
Increase open circuit voltage before stabilisation	0 %

#### I/V Part Load Characteristics

Values source	Manufacturer/user-created
Irradiance	200 W/m <sup>2</sup>
Voltage in MPP at Part Load	52.13 V
Current in MPP at Part Load	1.2 A
Open Circuit Voltage (Part Load)	60.93 V
Short Circuit Current at Part Load	1.292 A

#### Further

Voltage Coefficient	-176.6 mV/K
Electricity Coefficient	3.5 mA/K
Output Coefficient	-0.38 %/K
Incident Angle Modifier	100 %
Maximum System Voltage	1000 V
Spec. Heat Capacity	920 J/(kg*K)
Absorption Coefficient	70 %
Emissions Coefficient	85 %

#### Inverter: FRONIUS Galvo 1.5-1

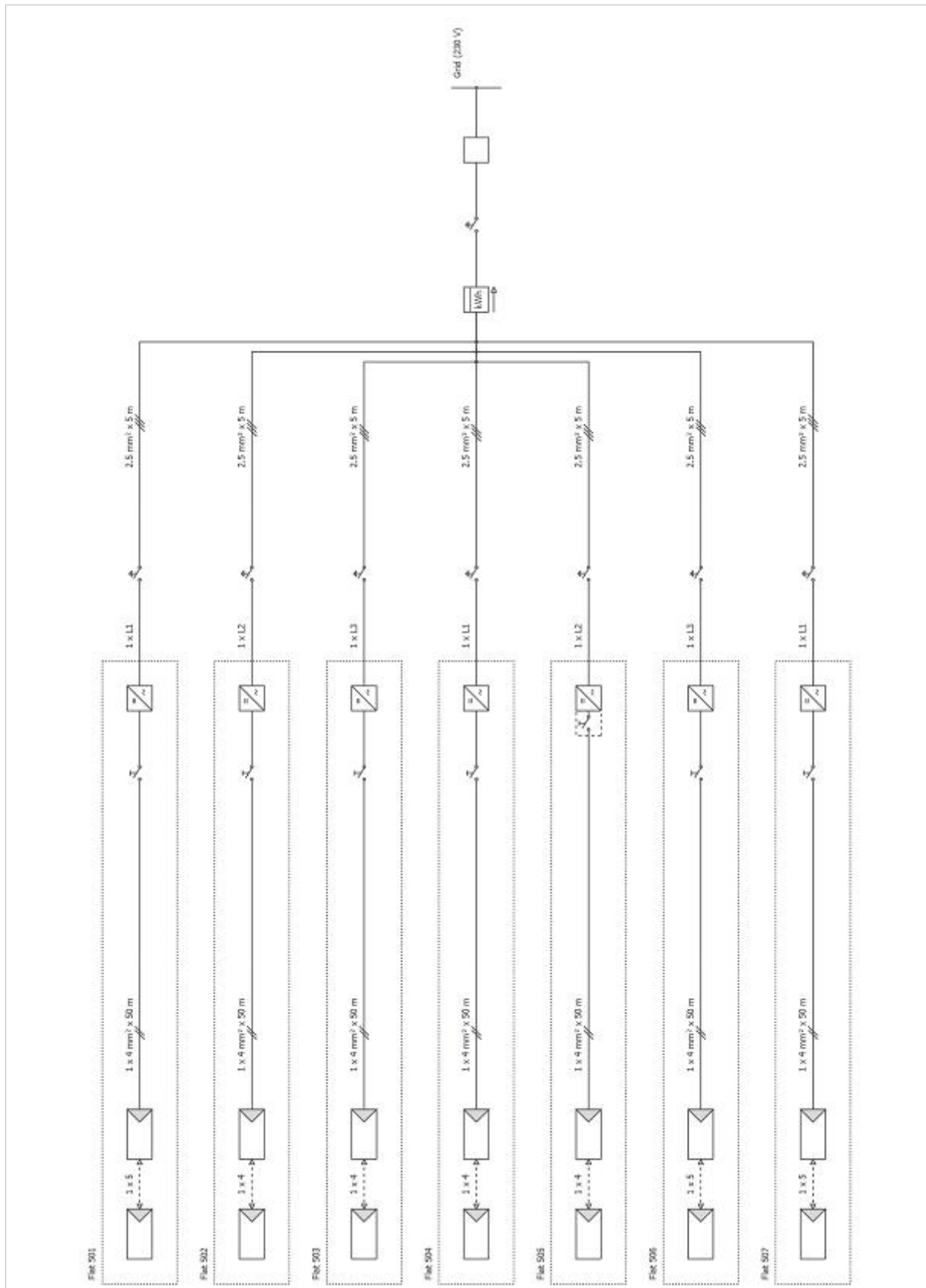
Manufacturer	Fronius International
Available	Yes

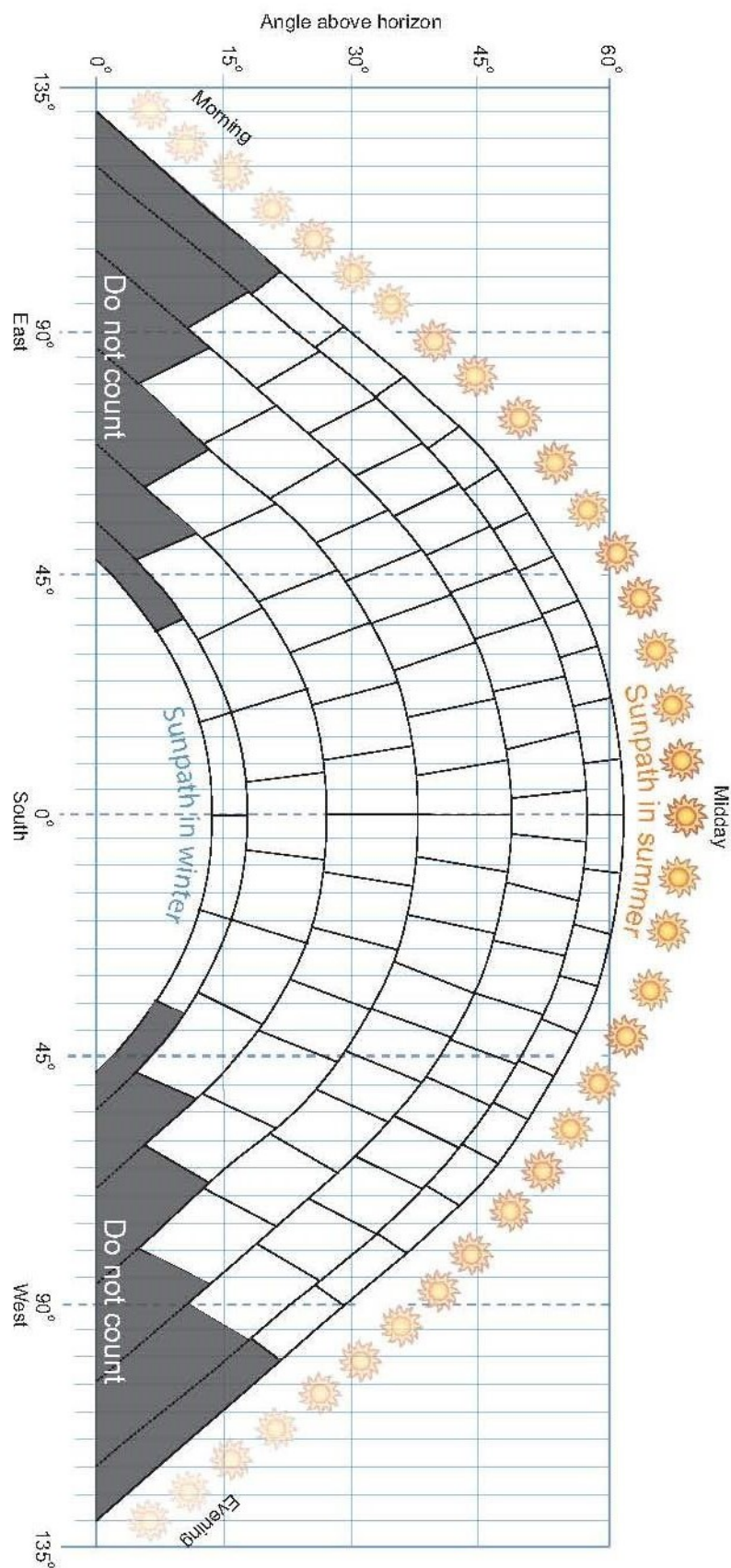
#### Electrical Data

DC Power Rating	1.6 kW
AC Power Rating	1.5 kW
Max. DC Power	1.6 kW
Max. AC Power	1.5 kW
Stand-by Consumption	7 W
Night Consumption	1 W
Feed-in from	20 W
Max. Input Current	20 A
Max. Input Voltage	420 V
Nom. DC Voltage	260 V
Number of Feed-in Phases	1
Number of DC Inlets	3
With Transformer	Yes
Change in Efficiency when Input Voltage deviates from Rated Voltage	-0.64 %/100V

#### MPP Tracker

Output Range < 20% of Power Rating	99.9 %
Output Range > 20% of Power Rating	100 %
No. of MPP Trackers	1
Max. Input Current per MPP Tracker	20 A
Max. Input Power per MPP Tracker	1.6 kW
Min. MPP Voltage	120 V
Max. MPP Voltage	335 V





## 6. TIMESCALE

Dependant on the timing of the order lead time can vary according to stock levels held and will be confirmed at time of order.

Once on site the rooftop installation of the PV area should take no longer than 1 week, although as this will be completed at the same time as the remaining roof area the labour will be on site significantly longer. Of course as with all roof works the timescale is weather dependant.

The electrical installation should also take no longer than 1 week, however deviation from the lengths of cable run detailed above could result in extended time on site.

As this project is < 16 A per phase the registration with your local electricity DNO can be completed up to 28 days after the final commissioning date. In order undertake this ICB will need to be supplied with the customers MPAN number which can be found on top of the electricity bill alongside a contact name who will be managing the installation. ICB (Projects) Ltd take no responsibility for the application being completed, unless supplied with the above information in a timely manner. The enclosed information makes no consideration for any future building works which may affect system performance, manufacturer's guarantees and warranties, and warranties of any installed equipment. Please note that any large developments to the South of the installation will significantly reduce system performance

## 7. PRODUCT LITERATURE



### SunPower® E-Series Residential Solar Panels | E20-327

#### More than 20% Efficiency

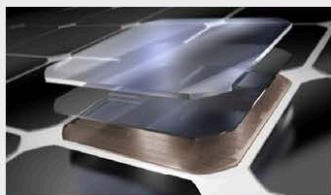
Ideal for roofs where space is at a premium or where future expansion might be needed.

#### High Performance

Delivers excellent performance in real world conditions, such as high temperatures, clouds and low light.<sup>1,2,3</sup>

#### Proven Value

Designed for residential rooftops, E-Series panels deliver the features, value and performance for any home.



**Maxeon™ Solar Cells: Fundamentally better.**

Engineered for performance, designed for durability.

#### Engineered for Peace of Mind

Designed to deliver consistent, trouble-free energy over a very long lifetime.<sup>4,5</sup>

#### Designed for Durability

The SunPower Maxeon Solar Cell is the only cell built on a solid copper foundation. Virtually impervious to the corrosion and cracking that degrade Conventional panels.<sup>4</sup>

#1 Rank in Fraunhofer durability test.<sup>10</sup>

100% power maintained in Atlas 25+

comprehensive Durability test.<sup>11</sup>

#### High Performance & Excellent Durability



SPR-E20-327



#### High Efficiency<sup>6</sup>

##### Generate more energy per square meter

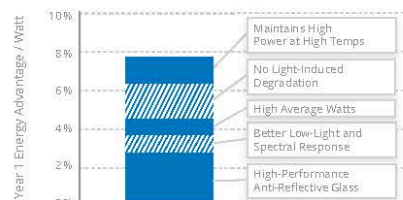
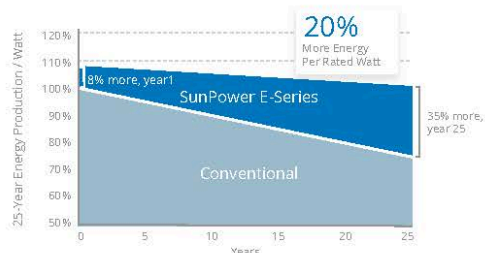
E-Series residential panels convert more sunlight to electricity producing 36% more power per panel,<sup>1</sup> and 60% more energy per square meter over 25 years.<sup>3,4</sup>

#### High Energy Production<sup>7</sup>

##### Produce more energy per rated watt

High year one performance delivers 7-9% more energy per rated watt.<sup>3</sup>

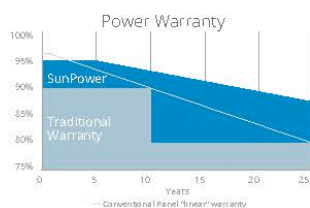
This advantage increases over time, producing 20% more energy over the first 25 years to meet your needs.<sup>4</sup>



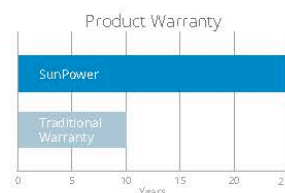




**Sunpower Offers The Best Combined Power And Product Warranty**



More guaranteed power: 95% for first 5 years, -0.4%/yr. to year 25.<sup>8</sup>



Combined Power and Product defect 25 year coverage that includes panel replacement costs.<sup>9</sup>

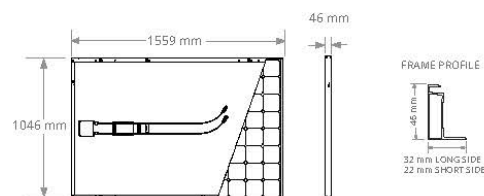
Electrical Data		
	SPR-E20-327	SPR-E19-320
Nominal Power (P <sub>nom</sub> ) <sup>12</sup>	327 W	320 W
Power Tolerance	+5/-0%	+5/-0%
Avg. Panel Efficiency <sup>13</sup>	20.4%	19.9%
Rated Voltage (V <sub>mpp</sub> )	54.7 V	54.7 V
Rated Current (I <sub>mpp</sub> )	5.98 A	5.86 A
Open-Circuit Voltage (V <sub>oc</sub> )	64.9 V	64.8 V
Short-Circuit Current (I <sub>sc</sub> )	6.46 A	6.24 A
Max. System Voltage	1000 V IEC & 600 V UL	
Maximum Series Fuse	15 A	
Power Temp Coef.	-0.38% / °C	
Voltage Temp Coef.	-176.6 mV / °C	
Current Temp Coef.	3.5 mA / °C	

Tests And Certifications	
Standard tests <sup>14</sup>	IEC 61215, IEC 61730, UL1703 (Type 2 Fire Rating)
Quality Certs	ISO 9001:2008, ISO 14001:2004
EHS Compliance	RoHS, OHSAS 18001:2007, lead free, PV Cycle, REACH SVHC-155
Ammonia test	IEC 62716
Desert test	10.1109/PVSC.2013.6744437
Salt Spray test	IEC 61701 (maximum severity)
PID test	Potential-Induced Degradation free: 1000V <sup>10</sup>
Available listings	TUV, MCS, UL, JET, CSA, CEC, FSEC

Operating Condition And Mechanical Data	
Temperature	-40°C to +85°C
Impact resistance	25mm diameter hail at 23 m/s
Appearance	Class A
Solar Cells	96 Monocrystalline Moxeon Gen II
Tempered Glass	High transmission tempered Anti-Reflective
Junction Box	IP-65 Rated, Yukita (YS-254/YS-255)
Weight	18,6 kg
Max load	Wind: 2400 Pa, 244 kg/m <sup>2</sup> front & back Snow: 5400 Pa, 550 kg/m <sup>2</sup> front
Frame	Class 1 black anodised (highest AAMA rating)

**REFERENCES:**

- All comparisons are SPR-E20-327 vs. a representative conventional panel: 250W, approx. 1.6 m<sup>2</sup>, 15.3% efficiency.
- PVEvolution Labs "SunPower Shading Study," Feb 2013.
- Typically 7.9% more energy per watt, BEW/DNV Engineering "SunPower Yield Report," Jan 2013.
- SunPower 0.25%/yr degradation vs. 1.0%/yr conv. panel, Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, Feb 2013; Jordan, Dirk "SunPower Test Report," NREL, Q4-2014.
- "SunPower Module 40-Year Useful Life" SunPower white paper, Feb 2013. Useful life is 99 out of 100 panels operating at more than 70% of rated power.
- Second highest, after SunPower X-Series, of over 3,200 silicon solar panels, Photon Module Survey, Feb 2014.
- 8% more energy than the average of the top 10 panel companies tested in 2012 (151 panels, 102 companies), Photon International, Feb 2013.
- Compared with the top 15 manufacturers. SunPower Warranty Review, Feb 2013.
- Some exclusions apply. See warranty for details.
- 5 of top 8 panel manufacturers from 2013 report were tested, 3 additional silicon solar panels for the 2014. Ferrara, C., et al. "Fraunhofer PV Durability Initiative for Solar Modules: Part 2," Photovoltaics International, 77-85, 2014.
- Compared with the non-stress-tested control panel Atlas 25+ Durability test report, Feb 2013.
- Standard Test Conditions (1000 W/m<sup>2</sup> irradiance, AM 1.5, 25° C). NREL calibration Standard: SOMS current, LACCS FF and Voltage.
- Based on average of measured power values during production.
- Type 2 fire rating per UL1703:2013, Class C fire rating per UL1703:2002.



Please read the safety and installation guide.

See <http://www.sunpower.com/facts> for more reference information.  
 For more details, see extended datasheet: [www.sunpower.com/datasheets](http://www.sunpower.com/datasheets).

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**SUNPOWER®**

/ Battery Charging Systems / Welding Technology / Solar Electronics



SHIFTING THE LIMITS

## FRONIUS GALVO

/ The future-proof inverter for small self-consumption systems.



/ With power categories ranging from 1.5 to 3.1 kW, the Fronius Galvo is perfect for households – and is especially suitable for self-consumption systems. The integrated energy management relay allows the self-consumption component to be maximised. A host of other smart features make the Fronius Galvo one of the most future-proof inverters in its class: for example, the integrated datalogging, the simple connection to the internet by WLAN, or the plug-in card technology for retrofitting additional functions.

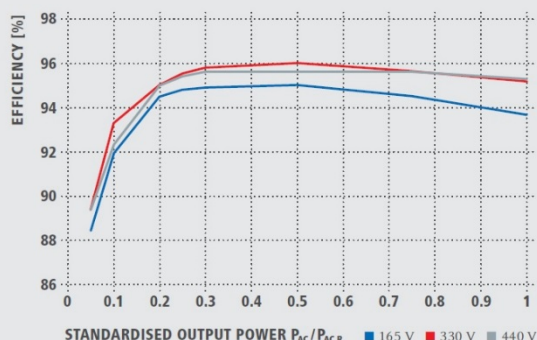
### TECHNICAL DATA FRONIUS GALVO

INPUT DATA	GALVO 1.5-1	GALVO 2.0-1	GALVO 2.5-1	GALVO 3.0-1 <sup>1)</sup>	GALVO 3.1-1
DC maximum power at cos φ = 1	1,600 W	2,140 W	2,650 W	3,160 W	3,310 W
Max. input current (I <sub>dc max</sub> )	13.3 A	17.8 A	16.6 A	19.8 A	20.7 A
Max. array short circuit current	20.0 A	26.8 A	24.8 A	29.6 A	31.0 A
Min. input voltage (U <sub>dc min</sub> )	120 V			165 V	
Feed-in start voltage (U <sub>dc start</sub> )	120 V			165 V	
Nominal input voltage (U <sub>dc,r</sub> )	260 V			330 V	
Max. input voltage (U <sub>dc max</sub> )	420 V			550 V	
MPP voltage range (U <sub>mpp min</sub> – U <sub>mpp max</sub> )	120 - 335 V			165 - 440 V	
Number of DC connections	3				
OUTPUT DATA	GALVO 1.5-1	GALVO 2.0-1	GALVO 2.5-1	GALVO 3.0-1 <sup>1)</sup>	GALVO 3.1-1
AC nominal output (P <sub>ac,r</sub> )	1,500 W	2,000 W	2,500 W	3,000 W	3,100 W
Max. output power	1,500 VA	2,000 VA	2,500 VA	3,000 VA	3,100 VA
Max. output current (I <sub>ac max</sub> )	7.2 A	9.7 A	12.1 A	14.5 A	15.0 A
Grid connection (U <sub>ac,r</sub> )	1-NPE 230 V				
Min. output voltage (U <sub>ac min</sub> )	180 V				
Max. output voltage (U <sub>ac max</sub> )	270 V				
Frequency (f <sub>r</sub> )	50 Hz / 60 Hz				
Frequency range (f <sub>min</sub> – f <sub>max</sub> )	45 - 65 Hz				
Total harmonic distortion	< 4 %				
Power factor (cos φ <sub>ac,r</sub> )	0.85 - 1 ind. / cap.				
GENERAL DATA	GALVO 1.5-1	GALVO 2.0-1	GALVO 2.5-1	GALVO 3.0-1 <sup>1)</sup>	GALVO 3.1-1
Dimensions (height x width x depth)	645 x 431 x 204 mm				
Weight	16.8 kg				
Degree of protection	IP 55				
Protection class	1				
Overvoltage category (DC/ AC)	2/ 3				
Night-time consumption	< 1 W				
Inverter concept	HF transformer				
Cooling	Regulated air cooling				
Installation	Indoor and outdoor installation				
Ambient temperature range	-25 - +50 °C				
Permitted humidity	0 to 100 %				
DC connection technology	Screw terminal connection 2.5 mm <sup>2</sup> - 16 mm <sup>2</sup>				
Mains connection technology	Screw terminal connection 2.5 mm <sup>2</sup> - 16 mm <sup>2</sup>				
Certificates and compliance with standards	ÖVE / ÖNORM E 8001-4-712, AS 4777-2, AS 4777-3, AS3100, DIN V VDE 0126-1-1/A1, VDE AR N 4105, IEC 62109-1-2, IEC 62116, IEC 61727, CER 06-190, CEI 0-21, EN 50438, G83, G59				

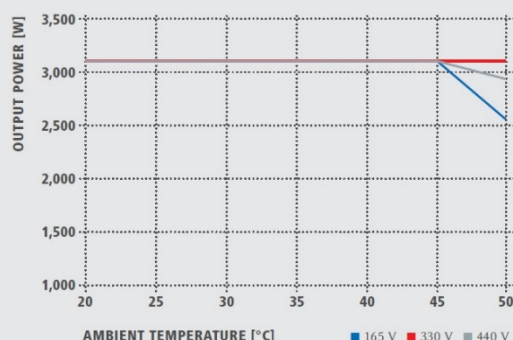
<sup>1)</sup> available for countries where 3 kW restrictions apply. Further information regarding the availability of the inverters in your country can be found at [www.fronius.com](http://www.fronius.com).



### FRONIUS GALVO 3.1-1 EFFICIENCY CURVE



### FRONIUS GALVO 3.1-1 TEMPERATURE DERATING



### TECHNICAL DATA FRONIUS GALVO

EFFICIENCY	GALVO 1.5-1	GALVO 2.0-1	GALVO 2.5-1	GALVO 3.0-1 <sup>1)</sup>	GALVO 3.1-1
Max. efficiency	95.9 %	96.0 %		96.1 %	
European efficiency (η <sub>EU</sub> )	94.5 %	94.9 %	95.2 %	95.4 %	95.4 %
η at 5 % P <sub>AC,R</sub> <sup>2)</sup>	84.5 / 86.0 / 86.0 %	84.2 / 86.1 / 85.9 %	88.6 / 89.6 / 89.4 %	88.2 / 89.2 / 89.1 %	88.4 / 89.4 / 89.4 %
η at 10 % P <sub>AC,R</sub> <sup>2)</sup>	87.5 / 89.7 / 89.6 %	89.6 / 91.4 / 91.3 %	91.2 / 92.3 / 91.4 %	91.8 / 93.1 / 92.1 %	91.9 / 93.3 / 92.3 %
η at 20 % P <sub>AC,R</sub> <sup>2)</sup>	91.3 / 93.3 / 93.1 %	92.6 / 94.3 / 93.9 %	94.0 / 94.8 / 94.5 %	94.4 / 95.0 / 94.9 %	94.5 / 95.0 / 95.0 %
η at 25 % P <sub>AC,R</sub> <sup>2)</sup>	92.4 / 94.1 / 93.9 %	93.3 / 94.9 / 94.5 %	94.5 / 95.1 / 95.0 %	94.8 / 95.5 / 95.3 %	94.8 / 95.5 / 95.4 %
η at 30 % P <sub>AC,R</sub> <sup>2)</sup>	93.0 / 94.6 / 94.3 %	93.6 / 95.2 / 94.9 %	94.8 / 95.5 / 95.3 %	94.8 / 95.7 / 95.6 %	94.9 / 95.8 / 95.6 %
η at 50 % P <sub>AC,R</sub> <sup>2)</sup>	93.9 / 95.5 / 95.2 %	94.3 / 95.8 / 95.2 %	95.0 / 95.7 / 95.2 %	95.0 / 96.0 / 95.5 %	95.0 / 96.1 / 95.6 %
η at 75 % P <sub>AC,R</sub> <sup>2)</sup>	94.2 / 95.6 / 95.4 %	94.0 / 95.9 / 95.6 %	94.8 / 95.9 / 95.6 %	94.6 / 95.8 / 95.6 %	94.5 / 95.6 / 95.6 %
η at 100 % P <sub>AC,R</sub> <sup>2)</sup>	94.0 / 95.9 / 95.6 %	93.5 / 95.6 / 95.5 %	94.4 / 95.7 / 95.5 %	93.9 / 95.4 / 95.3 %	93.7 / 95.2 / 95.3 %
MPP adaptation efficiency			> 99.9 %		
PROTECTION DEVICES	GALVO 1.5-1	GALVO 2.0-1	GALVO 2.5-1	GALVO 3.0-1 <sup>1)</sup>	GALVO 3.1-1
DC insulation measurement		Warning/shutdown (depending on country setup) at R <sub>ISO</sub> < 600 kOhm			
Overload behavior		Operating point shift, power limitation			
DC circuit breaker		Included			
INTERFACES	GALVO 1.5-1	GALVO 2.0-1	GALVO 2.5-1	GALVO 3.0-1 <sup>1)</sup>	GALVO 3.1-1
WLAN / Ethernet LAN		Fronius Solar.web / Fronius Solar.web, Modbus TCP, JSON			
6 inputs or 4 digital inputs/outputs		Interface to ripple control receiver			
USB (A socket) <sup>3)</sup>		For USB sticks			
2x RS422 (RJ45 socket) <sup>3)</sup>		Fronius Solar Net, interface protocol			
Signalling output <sup>3)</sup>		Energy management (potential-free relay output)			
Datalogger and Webserver		Included			

<sup>1)</sup> available for countries where 3 kW restrictions apply. <sup>2)</sup> and at U<sub>mpp min</sub> / U<sub>dc,r</sub> / U<sub>mpp max</sub>. <sup>3)</sup> also available in the light version.  
Further information regarding the availability of the inverters in your country can be found at [www.fronius.com](http://www.fronius.com).

/ Battery Charging Systems / Welding Technology / Solar Electronics

### WE HAVE THREE DIVISIONS AND ONE PASSION: SHIFTING THE LIMITS.

/ Whether Battery Charging Systems, Welding Technology or Solar Electronics - our goal is clearly defined: to be the technology and quality leader. With around 3,000 employees worldwide, we shift the limits of what's possible - our more than 850 active patents are testimony to this. While others progress step by step, we innovate in leaps and bounds. Further information about all Fronius products and our global sales partners and representatives can be found at [www.fronius.com](http://www.fronius.com)

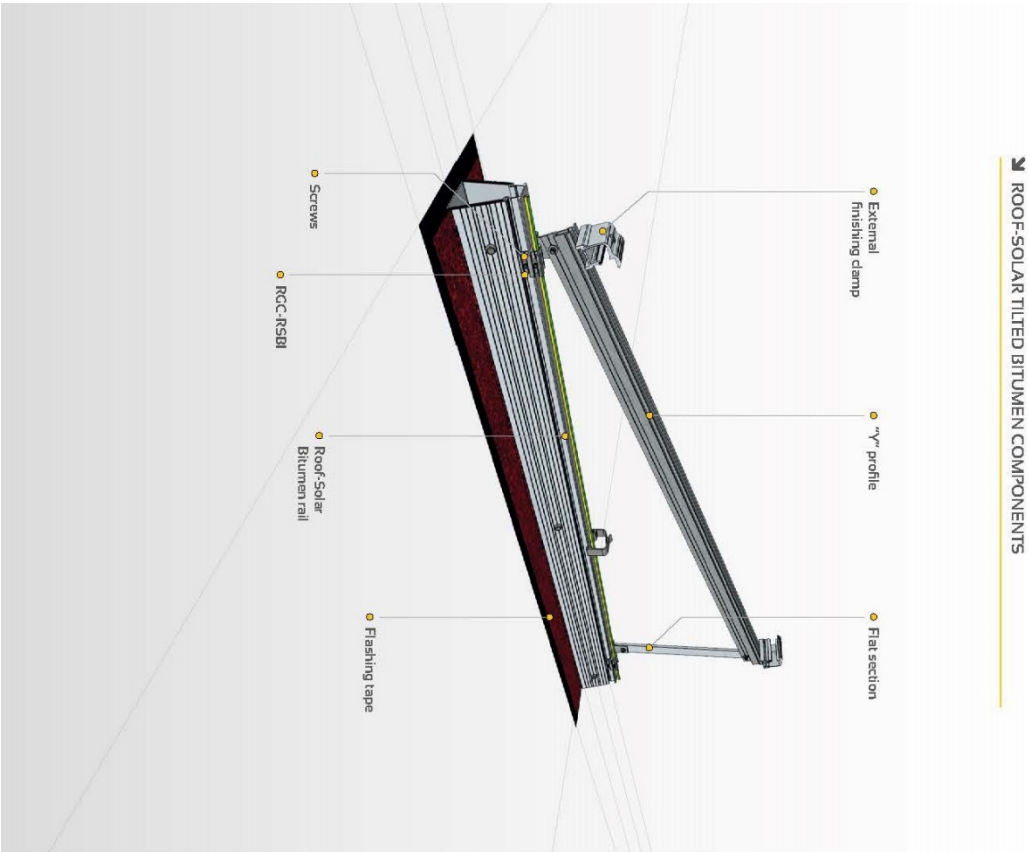


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# ROOF SOLAR TILTED BITUMEN

TILTED PV MOUNTING SYSTEM  
FOR BITUMEN ROOFS

ASSEMBLY INSTRUCTIONS | v2016

page  
of  
3  
8

## SAFETY

In general, it is advisable to follow the instructions below:

- Use common and personal protective equipment for the duration of the works.
- It is your responsibility to check the roof's load capacity.

- Working at heights is subject to specific regulations.
- The worksite must be signed and marked, and the permits for occupying public land must be valid.
- The housing structure for the solar generator must have been designed according to prevailing regulations, comply with the current technical standards, as well as with the regulations for snow and windy conditions.

- It is imperative to follow the solar module manufacturer's assembly instructions.
- Dome-Solar declines all liability in the event of an incident that might arise from non-compliance with the assembly instructions or by reason of components from competing companies being installed.

- It is imperative that the solar generator installers be qualified to do so.
- Throughout the installation, it is obligatory to have at least one copy of the installation instructions available on the site.
- Equipotential grounding must be included between the various installation components in compliance with the national regulations in force. They can be supplied by Dome-Solar (see RCC and RCC options).

- In the case of installation on public access buildings, the relevant building regulations concerning fire resistance, reaction to fire and behaviour of the roof must be adhered to.

## SUPPLIED



## OPTIONAL



CTM

Cable restainer

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## ROOF SOLAR TILTED BITUMEN

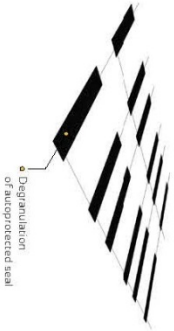
TILTED PV MOUNTING SYSTEM  
FOR BITUMEN ROOFS  
ASSEMBLY INSTRUCTIONS | V2016


page  
of 8

### 1 | INSTALLING THE ROOF-SOLAR TILTED BITUMEN RAILS ON THE ROOF



**1.1 Marking the position  
for the rails on the roof**  
Referring to the technical drawings supplied by Dome  
Solar and using a mason's line, locate the position  
of each column and each row of rails on the roof.  
Mark the position of all the columns.



**1.2 Fixing primer**  
It is necessary to perform a degranulation at the  
autoprotected seal, under the surface of each rail.  
 Under the surface of each rail,  
degranulate the bitumen with the help  
of a welding torch and a towel.



**1.3 Fitting the rails**  
With the flashing tape already welded on top,  
position the rails in place. Make sure that the rails  
are positioned correctly in relation to the mason's  
line. Finally, using a blow torch, weld the flashing  
tape to the waterproofing.  
Repeat the operation for all the rails in the row then  
for each remaining row.

 In all cases, refer to the drawings  
supplied by Dome Solar.

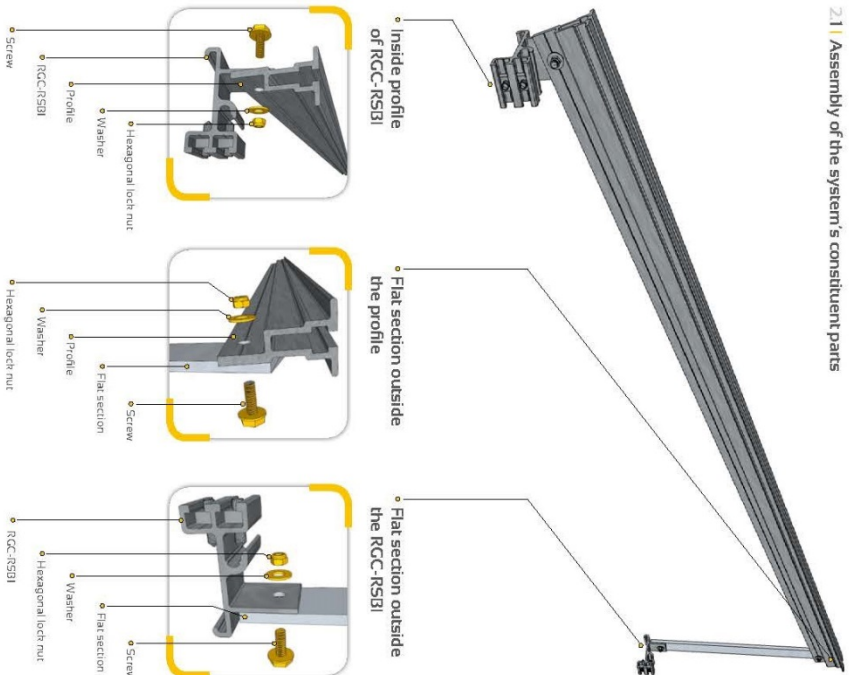
## ROOF SOLAR TILTED BITUMEN

TILTED PV MOUNTING SYSTEM  
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ASSEMBLY INSTRUCTIONS | V2016

page  
of 8

### 2 | PREPARATION AND INSTALLATION OF THE MODULE TILTING SYSTEM

#### 2.1 Assembly of the system's constituent parts





## ROOF SOLAR TILTED BITUMEN

TILTED PV MOUNTING SYSTEM  
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ASSEMBLY INSTRUCTIONS | V2016

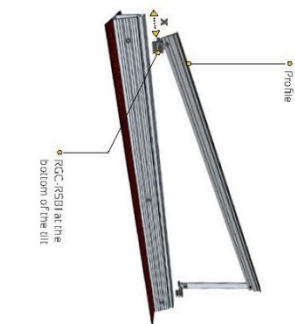
page  
of 18

## ROOF SOLAR TILTED BITUMEN

TILTED PV MOUNTING SYSTEM  
FOR BITUMEN ROOFS

ASSEMBLY INSTRUCTIONS | V2016

page  
of 18



### 2.2 | Installing the tilting system on the rails

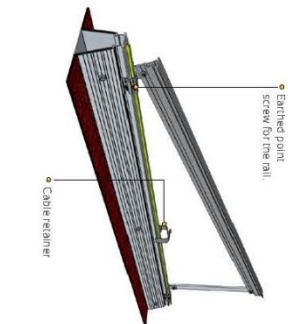
Position a tilting profile on each rail of your PV unit.



For this, make sure that the distance between the end of the rail and the RCC-RSBI is the same on each of the rails, (represented here by "distance X").



Once the tilting profile is in place, tighten the point screw of each RCC-RSBI, so as to immobilise the system on the rail.



### 2.3 | Grounding the rails

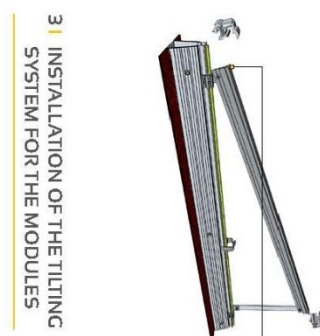
Route your solar grounding cable into the top part of the RCC-RSBI specified for this purpose.



Once the cable is installed, tighten the point screw of each RCC-RSBI, so as to immobilise the cable sheath and enters into contact with the cable core.



The cable retractor holds the cable on the rail, so it does not interfere with the seal.



### 3 | INSTALLATION OF THE TILTING SYSTEM FOR THE MODULES



### 2.4 | Installation of external clamps on the profile

To fit the external clamps onto the tilting profile, slice the square fixing nut into the groove of the profile specified for this purpose.

Repeat the operation for all the tilting profiles.



Position the PV module so it is supported on the lower external clamps, then tighten to immobilise them.



Adjust the position of the upper external clamps so that they are positioned firmly against the module frame, then tighten.

Repeat the operation for all the tilting systems.

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## 8. TERMS & CONDITIONS

These terms and conditions shall govern the contract between (1) ICB (International Construction Bureau) Ltd ("we") and (2) our customers ("you"). We may agree modifications to these terms but such modifications must be in writing signed by us and cannot be inferred from a course of behaviour.

### SCOPE OF THE CONTRACT

- 1.1 We provide sustainable roofing solutions which may include the provision of information and advice on a range of or specific roofing scheme(s) (the "Specifications") and associated products (the "Products") together with support in relation to installation of the chosen solution by a contractor appointed by you from our list of approved contractors maintained by us from time to time ("Approved Contractors") (all together the "Service") and will provide the Service more particularly specified in a written or verbal quotation (the "Quotation") which will usually be in relation to a specific project (the "Project").
- 1.2 A binding contract for the provision of the Service will be made upon our written or verbal confirmation of your order being: (i) your written acceptance of the Quotation; or (ii) your authority to proceed in accordance with the Quotation, (the "Order") or as otherwise agreed (incorporating in all cases these terms and conditions) (the "Contract").
- 1.3 A Quotation provided by us shall not constitute an offer, and is only valid for a period of 30 calendar days from its date of issue. We may alter Quotations at any time up to the date of our acceptance of your Order and we reserve the right to refuse to accept any Order that is deemed to be contrary to our company policies in force at that time.
- 1.4 Where the Service includes the provision of Specification(s), you acknowledge that the placing of your Order confirms your acceptance of such Specification(s) including any calculations carried out by you or by us or by any third party on your behalf.
- 1.5 Where the Service includes the provision of calculations, you acknowledge that we make no warranties as to the accuracy of such calculations and shall not be responsible for any losses incurred as a result of any shortcomings in such calculations howsoever arising.
- 1.6 Where the Service includes the provision of support in relation to installation of the chosen solution by an Approved Contractor, you acknowledge that such support does not include any form of supervision of the Approved Contractor nor does it include inspection or approval of any works carried out by the Approved Contractor.
- 1.7 You understand that the Service will be suitable for use in relation to our understanding of the Project only, unless we otherwise agree in writing.
- 1.8 You acknowledge that we do not warrant and shall not be responsible for: (i) the work or products of third parties (including Approved Contractors); (ii) the obtaining of any statutory approvals; (iii) the solvency of anybody associated with the Project (including Approved Contractors) whether or not they were appointed on the advice or recommendation of ourselves; or (iv) the completion of the Service in accordance with any agreed timetable.
- 1.9 We reserve the right to vary any of our Specifications as may become necessary from time to time in addition to our right to withdraw from offer any of our Products without prior warning.

- 1.10 It is our practice to maintain computer records of the Service following the completion of the Project, but we are not required to do so unless otherwise agreed in writing.

### 2. YOUR DUTIES

- 2.1 You accept that your knowledge of the Project is vital to the provision of the Service. As a result, we rely on you to provide us with all necessary information concerning the Project.
- 2.2 You are responsible for ensuring that the details of the Specification are complete and accurate.
- 2.3 You are responsible for providing all necessary permissions, licences and consents which may be required for the Service unless we expressly agree otherwise.
- 2.4 We will accept and act upon instructions communicated to us by any means by you or any third party acting on your behalf and we are not obliged to seek verification of such instructions. We cannot be bound by any instruction or communication unless and until it has actually been received and accepted by us.
- 2.5 Where the Service includes the provision of calculations by us, you are responsible for providing accurate and complete information to allow us to make such calculations. You are also responsible for checking and approving such calculations.
- 2.6 If applicable, you warrant that you are aware of and will comply with your duties under the CDM Regulations.
- 2.7 If we are to provide any part of the Service at your or a third party's premises, you shall (i) ensure that we have safe access to those premises, office accommodation and other services and facilities as are reasonably required by us; and (ii) keep and maintain all materials, equipment, documents and other property of ours at such premises in safe custody at your own risk, maintain all our property in good condition until returned to us, and shall not dispose of or use any of our property other than in accordance with our written instructions or authorisation.
- 2.8 You warrant that your representatives working on the Project together with any relevant third parties appointed by you will provide us with full and timely co-operation.
- 2.9 We shall not be liable for any damages, losses or extra costs howsoever arising as a result of you failing to comply with your duties under this Contract. We reserve the right to charge for any extra work required (to include without limitation any changes we are required to make to the Specification) together with any damages, losses and costs incurred or suffered by us due to your failure to comply with your duties. Such charges shall be in addition to the Contract Price.

### 3. TIMESCALES OF DELIVERY

- 3.1 We shall deliver any Products to the location confirmed in the Order or such other location as we may agree at any time after we notify you that the Products are ready.
- 3.2 Any stated delivery times of the Service are reasonable estimates only and time shall not be of the essence. We will, however, use our reasonable endeavours to comply with any agreed timetable.
- 3.3 You recognise that for us to perform the Service in a timely fashion and to meet any agreed timetable, you must respond to enquiries and deal promptly with the approval of any materials or Specifications submitted to you. You acknowledge that if you fail to do this, then we cannot be expected to perform the Service within the agreed period of time.
- 3.4 You shall be responsible for notifying us if delivery is not effected within 1 calendar day of the estimated date of delivery.
- 3.5 We shall not be responsible for any delay in performing, or failure to perform, any of our obligations in respect of the Service if such delay or failure results from events, circumstances or causes beyond our reasonable control (including without limitation force majeure or default of any third party) in which case (i) we will be entitled to a reasonable extension of time for performing such obligations; (ii) if the delay or non-performance continues for a period of 12 weeks or more either of us may terminate the Contract by giving the other party 14 calendar days' written notice; and (iii) this clause does not affect our right to payment for work carried out up to the date of termination.

### 4. ARRIVAL CHECK

- 4.1 You shall be responsible for checking all Products on receipt for any apparent defects generally or any apparent damage caused in transit and shall notify us in writing within 1 calendar day of arrival of any such defects. In the absence of such notification, you shall be deemed to have accepted the Products and shall have no rights of rejection. We will not be liable in respect of any defects in Products which are reasonably apparent on arrival and have not been notified to us in accordance with this clause.
- 4.2 In the event we receive such notice, we shall be given a reasonable opportunity of examining such defects, and if we consider that we are responsible, we shall, at our discretion, repair, replace or refund the price of the defective Products. You shall retain possession of any defective Products at no charge to us until such time as we have given you instructions as to their disposal.
- 4.3 However, we shall not be liable for such defects in any of the following events: (i) you failed to give notice in accordance with clause 4.1; (ii) you make any further use of such Products after giving notice in accordance with clause 4.1; (iii) the defect arises because you failed to follow our oral or written instructions as to the storage, commissioning, installation, use and maintenance of the Products or (if there are none) good trade practice regarding the same; (iv) the defect arises as a result of us following any drawing, design or specification supplied by you or on your behalf; (v) you alter or repair such Products without our written consent; (vi) the defect arises as a result of wilful damage, negligence or abnormal storage or working conditions; (vii) the Products differ from the Order as a result of changes made to ensure they comply with applicable statutory or regulatory requirements; or (viii) the defect arises as a result of us following any calculations supplied by you or a third party on your behalf or by us.

- 4.4 These terms and conditions shall apply to any repaired or replacement Products supplied by us.

### 5. WARRANTY

- 5.1 We will provide the Service using reasonable care and skill in accordance with the Order unless we are prevented by circumstances beyond our reasonable control.
- 5.2 Any Products supplied as part of the Service shall be of satisfactory quality. Unless otherwise agreed any Products supplied by us will be to our standard specification.
- 5.3 You accept reasonable tolerances in respect of quantity, quality, measurements, colour variation, markings and appearance.
- 5.4 Any samples, drawings, descriptive matter, or advertising produced by us and any illustrations contained in our catalogues or brochures are produced for the sole purpose of giving an approximate idea of the products described in them. They shall not form part of the Contract or have any contractual force.
- 5.5 We may be willing to offer an enhanced warranty for our Products on separate terms details of which are available upon request.

### 6. CONTRACT PRICE

- 6.1 The price for the Service is as set out in our Quotation and/or in respect of Products, the ICB Price List (available upon request) which is current at the time of placing the Order (the "Contract Price") plus any additional charges as set out in this Contract (the "Total Contract Price").
- 6.2 The Contract Price excludes transportation costs which will be identified in the invoice.
- 6.3 The Contract Price does not cover any extra work, additions, modifications, alterations or variations. We reserve the right to charge for any extra work, additions, modifications, alterations, or variations, howsoever arising.
- 6.4 Any estimate given of the whole or any part of the Contract Price is based upon information available to us at the time and shall remain valid for 30 calendar days unless otherwise advised and is given in good faith and shall be treated as an estimate only. Any errors and omissions shall be excused.
- 6.5 We reserve the right to alter the ICB Price List at any time without notice.
- 6.6 We may, by giving you notice at any time up to 14 calendar days before delivery, increase the price of any Products included in the Service to reflect any increase in the cost of the Products that is due to (i) any factor beyond our control (including foreign exchange fluctuations, increases in taxes and duties, increases in labour, materials and other manufacturing costs); (ii) any request by you to change the estimated delivery date(s), quantities or types of Products ordered, or the Specification; or (iii) any delay caused by any of your instructions or your failure to give us adequate or accurate information or instructions.

- 6.7 All prices quoted or estimated are exclusive of Value Added Tax or any other taxes which may be applicable from time to time.
- 6.8 We reserve the right to charge interest and claim compensation on overdue sums in accordance with the Late Payment of Commercial Debts (Interest) Act 1998. Interest will be calculated from the date of the invoice.
- 6.9 You may not withhold payment in respect of any part of the Total Contract Price by reason of claims or alleged claims and all rights of set off in common law and in equity are excluded.
- 6.10 Please note any approved third party costs may be invoiced prior to commissioning and we accordingly reserve the right to wait until such costs have been paid before commissioning or commencing such work.
- 7. NON CREDIT ACCOUNTS**
- 7.1 Invoices are raised on our confirmation of your Order.
- 7.2 Payment of invoices is due on receipt.
- 7.3 Any queries on the invoice must be brought to our attention prior to our despatch of the Products or commencement of the Services.
- 7.4 Where the Service includes the provision of Products, we will not arrange for the delivery of the Products (despite what may be written on the Quotation/Order or elsewhere regarding an estimated delivery date) until such invoices rendered by us to you have been settled in full.
- 8. CREDIT ACCOUNTS**
- 8.1 We may from time to time, at our absolute discretion, agree to offer credit to any of our customers which appear on the Register of UK Companies held at Companies House. We regret that we are unable to offer credit to unincorporated persons or entities.
- 8.2 We will confirm any agreed credit arrangement in writing which will be subject to these terms and conditions.
- 8.3 If we agree to provide credit, we will set you a credit limit when we open your account.
- 8.4 Our credit terms are strictly net i.e. payment shall be due from you so as to be received by us in cleared funds by the last day of the month following the month of delivery.
- 8.5 If Products are delivered in instalments, we shall be entitled to invoice each instalment as and when delivery thereof has been made and payment shall be due from you so as to be received by us in cleared funds by the last day of the month following the month of delivery.
- 8.6 Prompt payments shall be a condition precedent to future deliveries of Products due under any contract and to the continuation of credit facilities provided.
- 8.7 If any part of the total outstanding account becomes overdue, we reserve the right to demand payment of the whole sum outstanding.
- 8.8 Should your account exceed the agreed credit limit, we may request immediate payment to give you a trading balance. If no payment is received, we may, without prejudice to any other rights or remedies set out in this Contract, suspend your account until further notice.
- 8.9 Any failure by you to pay any due invoice, or failure to give delivery instructions in respect of any Products, shall cause the whole of the price for the Products already ordered at the time of such a default to become due forthwith without further notice.
- 8.10 Failure to pay in accordance with our credit terms shall entitle us, without prejudice to any other rights or remedies, to terminate the Contract immediately.
- 8.11 Your Order confirms your agreement that we may authorise a search through credit reference agencies, which will keep a record of that search and may share that information with other businesses. Your Order further confirms your agreement that we may make such enquiries of your directors as applicable.
- 8.12 You also authorise your bankers to provide us with an opinion as to your suitability for the requested account.
- 8.13 We reserve the right to vary the terms of or withdraw in its entirety or in part any credit facility at any time without notice.
- 9. TITLE AND RISK**
- 9.1 Where the Service includes the provision of Products, the risk in such Products shall pass to you on the Products being delivered to the specified delivery address.
- 9.2 Title to such Products shall not pass to you until we have delivered and received full payment in cleared funds for the Products.
- 9.3 Until title to such Products has passed to you, you shall: (i) hold the Products on a fiduciary basis as our bailee; (ii) store the Products separately from all other goods held by you so that they remain readily identifiable as our property; (iii) not remove, deface or obscure any identifying mark or packaging on or relating to the product; (iv) maintain that the product is in satisfactory condition and keep them insured against all risks for their full price from the date of delivery and arrange for the policy to bear an endorsement recording our title and interest which shall be produced to us upon request; (v) notify us immediately if you become subject to any of the events listed in clause 15.2; and (vi) give us such information relating to the Products as we may require from time to time.
- 9.4 If before title to the Products passes to you, you become subject to any of the events listed in clause 15.2, or we reasonably believe that any such event is about to happen and notify you accordingly, then, provided that the Products have not been resold, or irrevocably incorporated into another product, and without limiting any other right or remedy we may have, we may at any time require you to deliver up the Products and, if you fail to do so promptly, enter any premises of yours or of any third party where the Products are stored in order to recover them.
- 10. SUSPENSION**
- 10.1 If you fail to perform any relevant obligation (including without limitation payment in full of a sum due to us under this Contract), we may withhold delivery of any Products and suspend the performance of any or all of our obligations.
- 10.2 In the event of a suspension under this Contract, you shall pay the following:- (a) a reasonable amount in respect of costs and expenses which we reasonably incur as a result of exercising our right of suspension in clause 10.1; (b) (taking into account any sum paid under clause 10.2(a)), any adjustment to the Total Contract Price under clause 6; and (c) (taking into account any sums paid under clauses 10.2(a) and 10.2(b)) all reasonable costs and expenses which are properly and necessarily incurred by us in resuming the performance of the Services.
- 10.3 If our performance of the Services is prevented or delayed by any act or omission by you or failure by you to perform any relevant obligation ('Customer Default'); (a) we shall, without limiting our other rights or remedies, have the right to suspend performance of the Services until you remedy the Customer Default, and shall be relieved from the performance of any of our obligations to the extent such Customer Default prevents or delays our performance of any of our obligations; and (b) you shall reimburse us on written demand for any costs or losses sustained or incurred by us arising directly or indirectly from the Customer Default.
- 11. INTELLECTUAL PROPERTY**
- 11.1 Any copyright, design right, patent and/or other intellectual property rights recognised anywhere in the world (and whether registrable or not) arising in any of our work (such as specifications, designs, materials, drawings, illustrations, texts, photographs, prototypes, objects, models and mock up, whether stored or displayed physically or electronically and in whatever medium) (the "Intellectual Property") belongs exclusively to us and is hereby asserted.
- 11.2 Once you have made full payment of the Total Contract Price to us, the Service shall include a non-exclusive licence for you to use the Intellectual Property which forms part of the Service strictly for the purpose of the Project (the "Licence"). The Licence shall not include the right to adapt or modify any of the Intellectual Property nor the right to use or copy it (or authorise others to use or copy it) in whole or in part outside the Project in respect of which the Service was provided.
- 11.3 You shall indemnify us against all liabilities, costs, expenses, damages and losses suffered or incurred by us in connection with any claim made against us for actual or alleged infringement of a third party's intellectual property rights arising out of or in connection with your use or any sale of the Products and/or Licence.
- 11.4 Where Products are to be supplied in accordance with a specification supplied by you, we shall not be responsible for the adequacy or otherwise of such specification and you shall indemnify us against all liabilities, costs, expenses, damages and losses suffered or incurred by us in connection with any claim made against us for actual or alleged infringement of a third party's intellectual property rights arising out of or in connection with our use of your specification.
- 12. DUTY OF CONFIDENTIALITY**
- 12.1 Both of us will use our best endeavours to preserve the confidential information of the other and/or comply with the other's reasonable requirements in this regard. You recognise that our methods of working and pricing structures are proprietary and are not generally in the public domain.
- 12.2 We rely on you to inform us if any information or material produced to us in connection with the Service is confidential and all such materials supplied to us must be marked accordingly as "confidential".
- 13. PUBLICITY**
- 13.1 Once the Project is completed and in the public domain, we shall have a right to reasonable publicity (including but not limited to the inclusion in any publication of our work in whatever media) of the work created during the Service.
- 13.2 We shall have the right to identify ourselves in a reasonable manner of the provider of the Service to you.
- 13.3 We reserve the right where we consider it appropriate to require any reference or attribution to be made or removed from work provided as part of the Service.
- 14. YOUR CANCELLATION RIGHTS**
- 14.1 You may only cancel the Service with immediate effect by giving us written notice if:
- 14.1.1 We break this Contract in any material way and we do not correct or fix the situation within 28 calendar days of you asking us to do so in writing; or
- 14.1.2 We go into liquidation or a receiver or an administrator is appointed over our assets.
- 15. OUR CANCELLATION RIGHTS**
- 15.1 We may cancel the Contract at any time by providing you with at least 7 calendar days' notice in writing.
- 15.2 However, we may cancel the Contract at any time with immediate effect by giving you written notice if:
- 15.2.1 You do not pay us when you are supposed to, as set out in this Contract and fail to do so within 7 calendar days of us reminding you in writing. This does not affect our right to charge you interest under clause 6; or
- 15.2.2 You break the Contract in any other material way and you do not correct or fix the situation within 14 calendar days of us asking you to do so in writing in respect of situations which are fixable; or
- 15.2.3 You cease trading, become insolvent, go into liquidation or a receiver or an administrator is appointed over your assets or we reasonably believe that any such event is about to happen.

- 16. CONSEQUENCES OF CANCELLATION** On cancellation of the Contract by either party for any reason:
- 16.1 You shall immediately pay to us all our outstanding unpaid invoices and interest in respect of Services rendered;
- 16.2 In respect of Services supplied or any costs incurred prior to the date of termination, but for which no invoice has yet been submitted, we shall submit an invoice, which shall be payable by you immediately on receipt;
- 16.3 You shall immediately return Products that have been delivered to you and are not fully paid for.
- 16.4 In respect of any returned Products, we will charge 10% of the invoice sum for the Products as a handling fee.
- 16.5 The exercise of cancellation rights shall not prejudice any other rights or remedies that the cancelling party may have; and
- 16.6 Clauses which expressly or by implication have effect after termination shall continue in full force and effect.
- 17. LIMITATION OF LIABILITY**
- 17.1 **Complaints:** Without prejudice to the provisions of clause 4, in the event of a complaint about any aspect of the Service (i.e. including complaints about Products), you shall in the first instance notify us in writing within 7 calendar days of completion of the Service. In the absence of such notification, you shall be deemed to have accepted the quality of the Service and shall have no rights of rejection insofar as any Products are concerned.
- 17.2 **Treatment of Complaints:** In the event we receive such notice, we shall be given a reasonable opportunity of investigating such complaint, and if we consider that we are responsible, we shall, at our discretion, repair, replace, or refund an amount or offer such other remedy which we deem appropriate and commensurate with the complaint suffered. You shall retain possession of any Products subject to the complaint at no charge to us until such time as we have given you instructions as to their disposal. These terms and conditions shall apply to any remedy offered unless we state otherwise.
- 17.3 **Excluded Complaints:** However, we shall not be responsible for any complaint in any of the following events: (i) you failed to give appropriate notice; (ii) you make any further use of Products which are subject to the complaint; (iii) the complaint arises because you failed to follow our oral or written instructions as to the storage, commissioning, installation, use and maintenance of any Products which are subject to the complaint, or (if there are none) good trade practice regarding the same; (iv) the complaint arises as a result of us following any drawing, design or specification supplied by you or on your behalf; (v) you alter or repair any Products subject to the complaint without our written consent; (vi) the complaint arises as a result of wilful damage, negligence or abnormal storage or working conditions; or (vii) any Products subject to the complaint differ from the Order as a result of changes made to ensure they comply with applicable, statutory or regulatory requirements.
- 17.4 **Excluded Defects:** We shall not be liable for any defects, complaints or otherwise which arise out of any acts, omissions, negligence or default of you, your staff, agents or of any other third party associated with the Project (whether or not an Approved Contractor) including without limitation any failure by you to comply with any of our recommendations as to storage, handling or usage of the Products, in isolation or with other materials; or misuse of the Products. You shall keep us indemnified against all costs, claims, demands, expenses and liabilities of whatsoever nature made by third parties caused in whole or in part by, or arising out of, any act of omission by you in connection with the use, storage or sale of the Products.
- 17.5 **Excluded Advice:** All or any statements, recommendations and advice given (whether before or after the Contract) by us or our representatives to you or your representatives as to any other matter relating to the Service, are given without responsibility and shall not give rise to any liability whatsoever unless confirmed in writing in response to a specific written request from you before or at the time the Contract is made, in which case you accept that such advice is subject to these terms and conditions and is given in relation to a particular Project and to you alone. Such advice may not, without our prior written consent, be used for any other purpose, disclosed to any person or relied upon by any third party. You will not refer to our advice in any public document or communication without our prior written consent. You will be solely responsible for any such public document or communication and we do not and will not accept responsibility for or authorise the contents of, and shall not be represented as having accepted responsibility for or authorised the contents of, all or any part of such document or communication for any purpose.
- 17.6 **Performance Figures:** Any performance figures given by us are as provided by suppliers, external bodies and based on experience, and we therefore accept no responsibility or liability for any claims made by suppliers or other external parties.
- 17.7 **Excluded Warranties:** Except as provided for in this Contract, any warranties (whether implied by statute, common law or otherwise) are hereby excluded to the fullest extent permissible by law.
- 17.8 **Excluded Losses:** We shall under no circumstances whatsoever be liable, whether in contract, tort (including negligence), breach of statutory duty or otherwise for any loss of/damage to profit, reputation or goodwill or any indirect or consequential loss arising under or in connection with the Contract.
- 17.9 **Capped Liability:** Our total liability to you in respect of all other losses arising under or in connection with the Contract, whether in contract, tort (including negligence), breach of statutory duty or otherwise, shall in no circumstances exceed the greater of the sums paid by you under the Contract or such sum that shall be receivable by us in respect of any claim under any insurance policy effected by us from time to time.
- 18. LEGAL**
- 18.1 **Entire Agreement:** These terms and conditions (and any applicable summary) together with the Quotation and Order shall constitute the entire agreement between the two of us and supersede and extinguish all previous drafts, agreements, arrangements and understandings between us, whether written or oral, relating to the Project. Both of us agree that we shall have no remedies in respect of any representation or warranty (whether made innocently or negligently) that is not set out in these terms and conditions, the Quotation or Order. Neither of us shall have any claim for innocent or negligent misrepresentation based upon any statement in these terms and conditions, the Quotation or Order. These terms and conditions apply to the Contract to the exclusion of any other terms that you seek to impose, incorporate, or which are implied by trade, custom, practice or course of dealing to the extent this is legally permitted by law.
- 18.2 **Non Solicitation:** You agree that during the Service and for a period of 12 months from completion of the Project that you shall not:-
- 18.2.1 Approach any of our employees regarding the possibility of them providing services directly to you independent of ourselves;
- 18.2.2 Engage or employ or offer to engage or employ an employee or former employee (being a person who has been an employee of ours in the previous 6 months) for the provision of services that we are capable of providing; and
- 18.2.3 Contract directly with any subcontractor of ours (other than Approved Contractors) who have been associated with the provision of the Service to you.
- 18.3 **TUPE:** You warrant that no person, company or agency other than ourselves are employed or engaged or have been employed or engaged in connection with the Service. You shall indemnify us in full for and against all claims, costs, expenses or liabilities howsoever and whensoever arising incurred or suffered by us in relation to any provisions of the Transfer of Undertakings (Protection of Employment) Regulations.
- 18.4 **Third Party Rights:** A person who is not a party to this Contract shall not have any rights under or in connection with it.
- 18.5 **Data Protection:** Both of us shall comply with our respective obligations under the Data Protection Act 1998 relating to the use and storage of any personal information.
- 18.6 **Assignment:** You shall not assign or transfer, or purport to assign or transfer, any Contract to which these terms and conditions apply (or the benefit thereof) to any other person whatsoever without our prior written consent. We may at any time assign, transfer, charge, subcontract or deal with any other manner with all or any of our rights or obligations under the Contract. We reserve the right to supply and invoice the Service through any of our subsidiaries or associated companies.
- 18.7 **Severance:** If any court or competent authority finds that any provision of the Contract (or part of any provision) is invalid, illegal or unenforceable, that provision or part-provision shall, to the extent required, be deemed to be deleted, and the validity and enforceability of the other provisions of the Contract shall not be affected. If any invalid, unenforceable or illegal provision of the Contract would be valid, enforceable and legal if some part of it were deleted, the provision shall apply with the minimum modification necessary to make it legal, valid and enforceable.
- 18.8 Waiver:**
- 18.8.1 A waiver of any right under the Contract is only effective if it is in writing and shall not be deemed to be a waiver of any subsequent breach or default. No failure or delay by a party in exercising any right or remedy under the Contract or by law shall constitute a waiver of that or any other right or remedy, nor preclude or restrict its further exercise. No single or partial exercise of such right or remedy shall preclude or restrict the further exercise of that or any other right or remedy.
- 18.8.2 Unless specifically provided otherwise, rights arising under the Contract are cumulative and do not exclude rights provided by law.
- 18.9 **Notices:** All notices to be given under this Contract shall be in writing and shall either be delivered personally or sent by first class recorded delivery pre-paid post and shall be deemed to be served at the time of delivery in the case of the person who has delivered notice or 2 clear business days after the date of despatch in the case of a notice sent inland by first class prepaid post.
- 18.10 **Disputes:** In the event of a dispute, a senior representative from ourselves and from you shall meet to see if it can be resolved and the parties shall consider but shall not be obliged to agree an alternative dispute resolution otherwise all disputes shall be resolved through the courts.
- 18.11 **Law and Jurisdiction:** This Contract shall be governed by and construed in accordance with the law of England and shall be subject to the exclusive jurisdiction of the English Courts.
- 18.12 **Company Information:** Our company is registered in England and Wales under Company Number 01900160 and our registered office is at Unit 9 – 11 Fleets Industrial Estate, Willis Way, Poole, Dorset BH15 3SU.