SUNWARE

Solar Systems

for water sport, off-road
& outdoor use

About SunWare

Solar Systems for Yachting, Caravans, Off-road & Outdoor

Since our foundation in 1987, we develop and produce solar panels and charge controllers.
SunWare products are specifically designed and manufactured for long-term use in extreme applications and environmental conditions. Our products have stood the test for many years, on yachts and vehicles, as well as in high altitudes and on all types of buoys in coastal waters.
SunWare is an OEM for shipyards, off-road vehicles and buoy manufacturers.

Made in Germany

SunWare solar panels are developed and manufactured in Duisburg - Germany. All components, with the exception of the solar cells, are also produced in Germany or nearby European countries.

Quality Claim

We test our products in our in-house climate exposure test cabinets and saltwater test facilities using real North Seawater already during development and with random samples from ongoing production.
No matter if bending test, vibration test, overvoltage test, movement test, ... , only if all these tests are passed successfully, a SunWare product starts its partly long journey to our customers around the globe.

Development and Research

Neben der Fertigung unserer Solarmodule und Laderegler arbeiten wir beständig an der Optimierung bestehender Produkte und investieren zeitgleich in die Entwicklung neuer Produktionsprozesse und Produkte.

SunWare products have been in use all over the world for more than 30 years. And we can proudly say: they have proven themselves optimally!

Content:

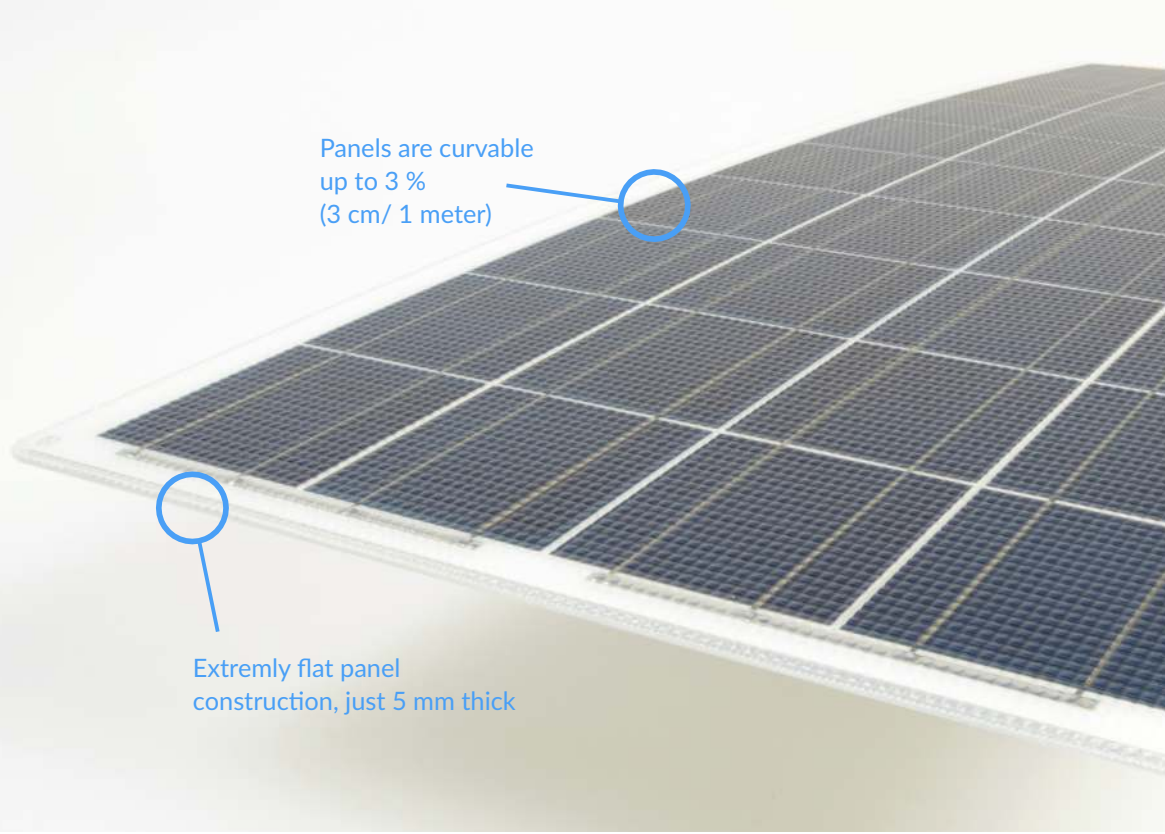
Photo: hallberg-rassy.com

Photo: ex-tec.de

Power für **Refridgerator, Light** and **Navi**

What can I use a solar system for ?

Imagine perfectly chilled drinks at any time!
Even a 100 Wp solar panel generates enough electricity to power your refrigerator and lights. No more running the engine just to charge the batteries.
When the engine is turned off and the plug is pulled, power supply quickly becomes a problem. SatNav, laptop, refrigerator, TV, tablet and pumps all need power.
The answer is solar panels.
For charter boats and rental caravans that are not usually fitted with solar panels, the RX-series offers plug & play solar panels with controller and vehicle plug as the ideal solution.



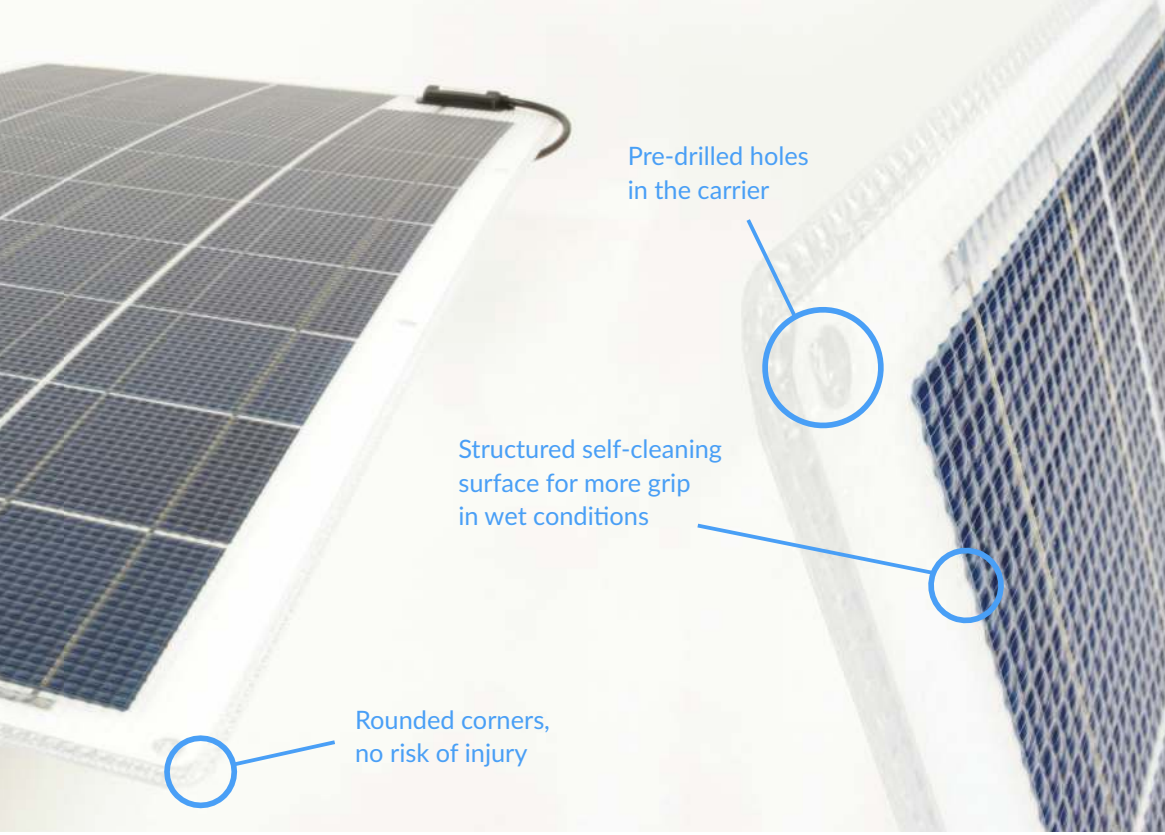
Design & Material

Superior in Detail-1

SunWare solar panels are designed for use in sea and salt water.

All panel components are selected to withstand the harsh realities on board and undergo thorough testing. The first SunWare panel saw the light of day in 1989. Since then, it has seen several up-grades, incorporating sophisticated detail solutions and new concepts.
This explains why, over the years, SunWare solar panels have come to be known and valued for their robust and reliable performance even under extreme conditions.
All SunWare solar panels are made in Germany, with manufacturing based in Duisburg.

The high-performance fluoropolymer film applied to the front and back is a modified ETFE film. Thanks to its superior self-cleaning properties, even stubborn soiling will easily come off in the next shower.
Unlike most synthetic materials, this premium film will not turn dull or brown as a result of exposure to UV light and weather.

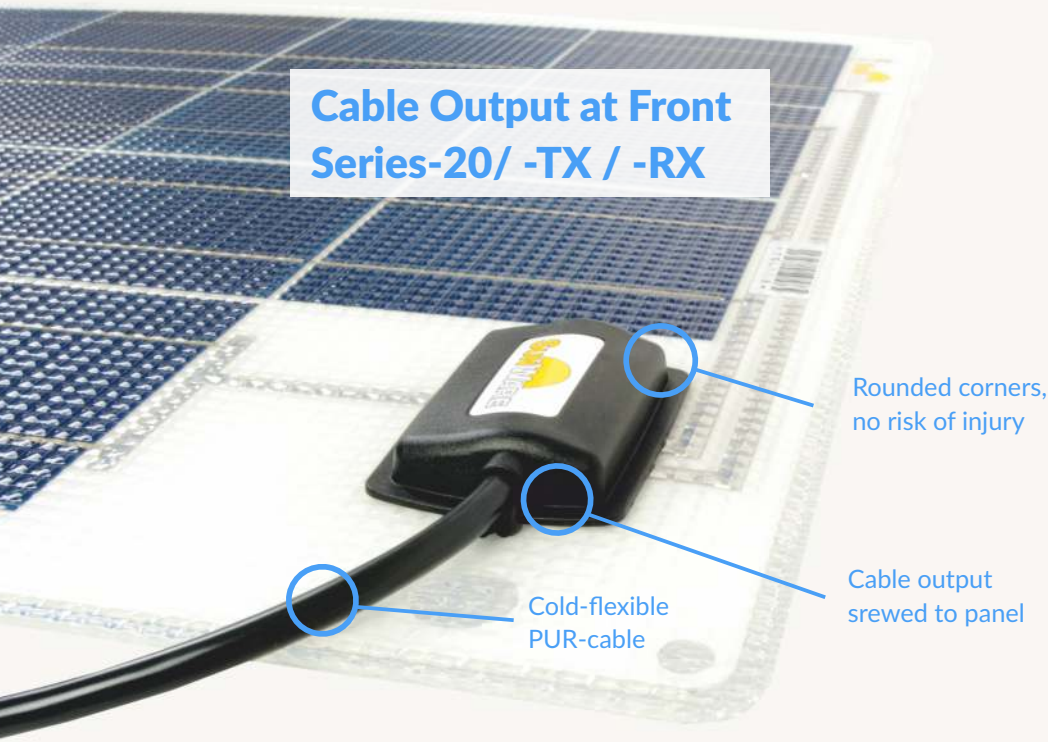


Design, Development & Production
Made in Germany - by SunWare

Even after 20 years of travelling the waters, our panels display no obvious signs of browning or brittleness.

SunWare uses only the best crystalline solar cells for maximum performance. Using our own laser cutters, the cells are cut to size for panels of varying dimensions. The cells in the panel laminate are bonded using a special, flexible bonding technique developed by SunWare to minimise the mechanical stress between the cells down to negligible levels.

This solution has proved itself for now almost 30 years.
The solar cells are fully encapsulated in exceptionally strong EVA laminate. An aluminium sandwich panel as a base for the cells gives the panel rigidity and protects the cells from damage due to local stress. In addition, the aluminium sandwich core dissipates the heat from the cells for homogeneous heat distribution in the panel.
If mounted on a rigid surface, the panel is even safe to walk on with deck shoes.



Cable Output & Connection Cable

Superior in Detail-2

We advise, however, to install the panels away from usual walkways.
The aluminium sandwich core is completely encapsulated by the laminate. For even greater protection, the panel's laminate extends a full 5mm beyond the mounting plate, keeping the aluminium sandwich core well protected against salt water.

The cable outlet is screwed to the panel, completely sealed and designed without sharp edges. It is secured inside the junction box by a strain relief connector.

All panels in the 20/40-series can be combined as required. For 24V systems, SunWare offers special 24V panels or recommends connecting two 12V panels (for 24V systems) in series. All panels are designed for a maximum system voltage of 24V.
SunWare solar panels come in a range of types for different applications and installation scenarios:

1. 20/40-series panels for fixed installation. Designed with a large number of cells, the

Salt & Sea Water-Resistant Components for Extreme Conditions

solar panels in this series can be installed without rear ventilation. The higher voltage compensates for the voltage drop with increasing cell temperatures.
All larger panels feature a cell protector for each panel that must be mounted and operated in a dry place. The cell protector includes 2 bypass diodes to prevent hot spots.

2. TX-series panels for bimini, sprayhood and tarpaulin.
These panels feature LOXX fasteners that are easy to clip onto textile surfaces.
The panel cable runs along the frame to the deck. Each TX panel is supplied with all necessary components and tools for proper attachment.

3. RX-series panels for mobile use.
These panels are provided with eyelets for mobile applications, a 5m connection cable and a mini charge controller with car plug.
Plug & play solution. Unpack panel, plug in charge controller – done.

Solar Panels
20-series, 40-series

For Walk-On, Flat Deck Mounting

The right solar panel for any application.
You can now optimise the available space. Be it long and narrow or square, our wide range of panel types means you'll always find a size to suit your needs.

All panels in the 20- and 40-series are similar in design but different in terms of cable outlet. Solar panels in the 20-series have a front-side outlet, with cable routing to the right, and a completely flat rear. Modules in the 40-series are designed with a rear outlet, which requires a cut-out or recess for flat mounting on deck to accommodate the junction box on the back of the panel.

Solar panels in the 20/40-series - available with white or black background - are made for permanent, fixed installation.

The rear is pre-treated with a one-component polyurethane adhesive. Alternatively, the panel can be screwed to the mounting plate in the intended locations. The panels can also be mounted on uniaxially curved deck/roof surfaces with a curving of up to 3 cm per meter.

Photo: Bestevar 66 ST | KM Yachts | www.kmy.nl

Perfect for **Deck, Sliding Hatches** and **Hardtop** for **12V** & **24V**

Solar Panels **Series-20/-40** white or black

Dimension & Current Output

Panel Type	*Power*	*Dimension*	*Weight*	*Current*
12V system voltage				
SW-**20185**	**120 Wp**	1012 x 689 mm	4,7 kg	6,48 A
SW-**20184**	**90 Wp**	859 x 689 mm	4,2 kg	4,30 A
SW-**20183**	**68 Wp**	599 x 689 mm	3,0 kg	3,24 A
SW-**20182**	**50 Wp**	469 x 689 mm	2,5 kg	2,43 A
SW-**20166**	**90 Wp**	1119 x 481 mm	3,6 kg	4,29 A
SW-**20165**	**60 Wp**	772 x 481 mm	2,6 kg	2,85 A
SW-**20164**	**45 Wp**	599 x 481 mm	2,0 kg	2,17 A
SW-**20163**	**33 Wp**	426 x 481 mm	1,4 kg	1,60 A
SW-**20146**	**46 Wp**	1154 x 273 mm	2,2 kg	2,15 A
SW-**20145**	**30 Wp**	807 x 273 mm	1,6 kg	1,51 A
SW-**20144**	**22 Wp**	634 x 273 mm	1,2 kg	1,11 A
SW-**20143**	**15 Wp**	468 x 243 mm	0,8 kg	0,76 A
24V system voltage				
SW-**22146**	**90 Wp**	1119 x 493 mm	3,6 kg	2,15 A
SW-**22145**	**60 Wp**	772 x 493 mm	2,6 kg	1,42 A

Wp = Peak power (W) under standard conditions, irradiation 1000 W / m², 25 ° C

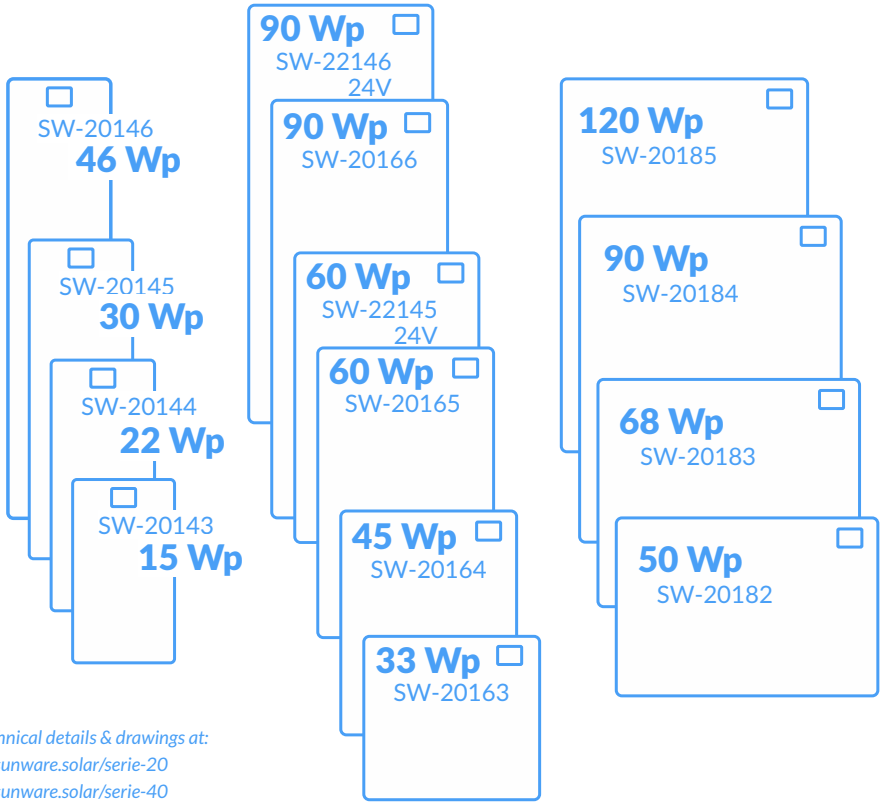
20/-40-Series
Cable Outlet on the Front/ Rear

For Gluing & Screwing

Screw rosettes

Cable entry point

Walkable



Technical details & drawings at:
en.sunware.solar/serie-20
en.sunware.solar/serie-40


Photo. lityummarin.com


Photo: kmy.nl
TinLizzy

20-Series
Cable Outlet on the Front

Walkable, Flat Deck Mounting

Textile Panels for **Bimini, Sprayhood** and **Tarpaulin**

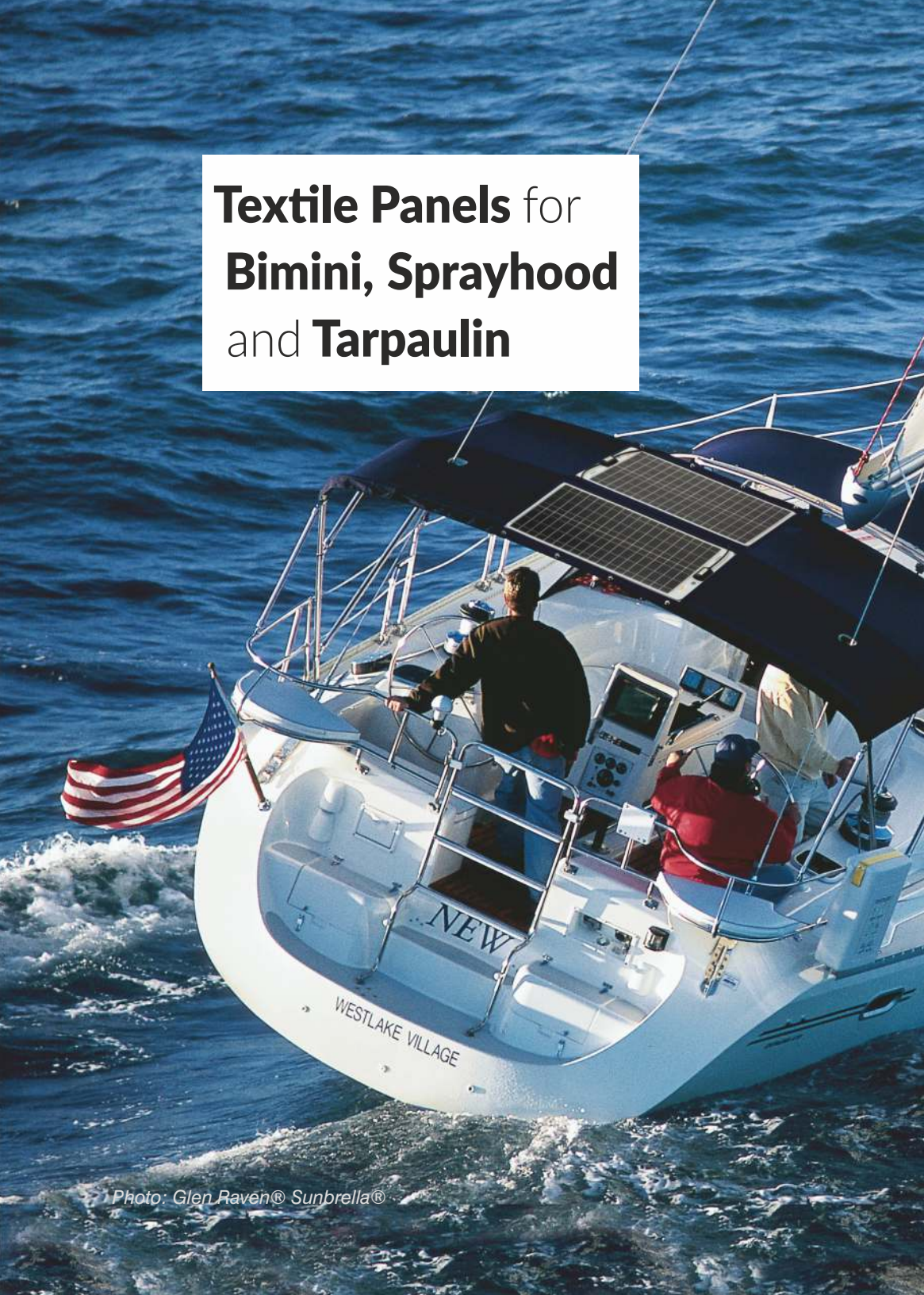


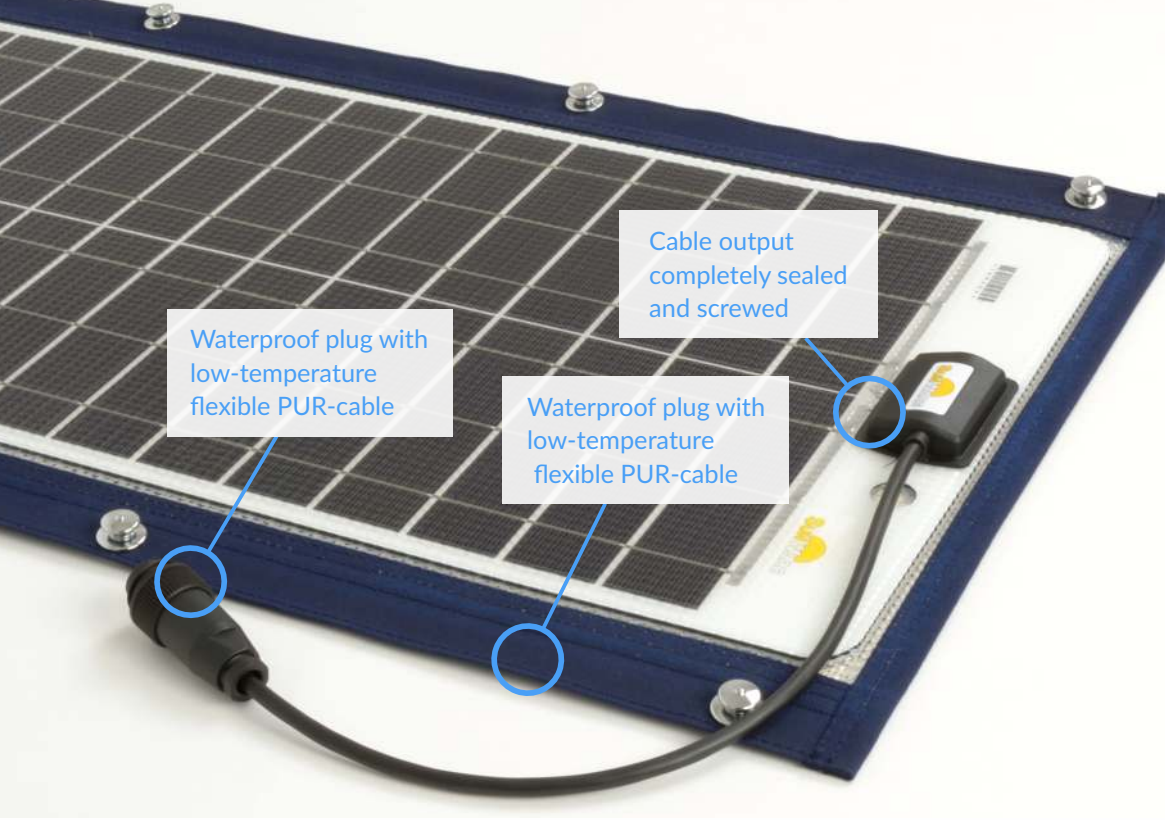
Photo: Glen Raven® Sunbrella®

Solar Panels
TX-Series

1- to 4-Wing Panels with Textile Edge

Solar energy on so far unused boat surfaces.
Lightweight panels with textile edge made of high-quality tarpaulin.
TX panels are specially designed for mounting on bimini or sprayhood.

The panels consist of one or more wings. Multi-wing panels are firmly connected by textile joints. The cable between the panels runs along the joints, so that tension and buckling can't affect the cable.
The panel's compact measurements make for easy transporting by car and storing almost anywhere on board. You can now even take a 240Wp panel – the TX-42052 – on a plane.



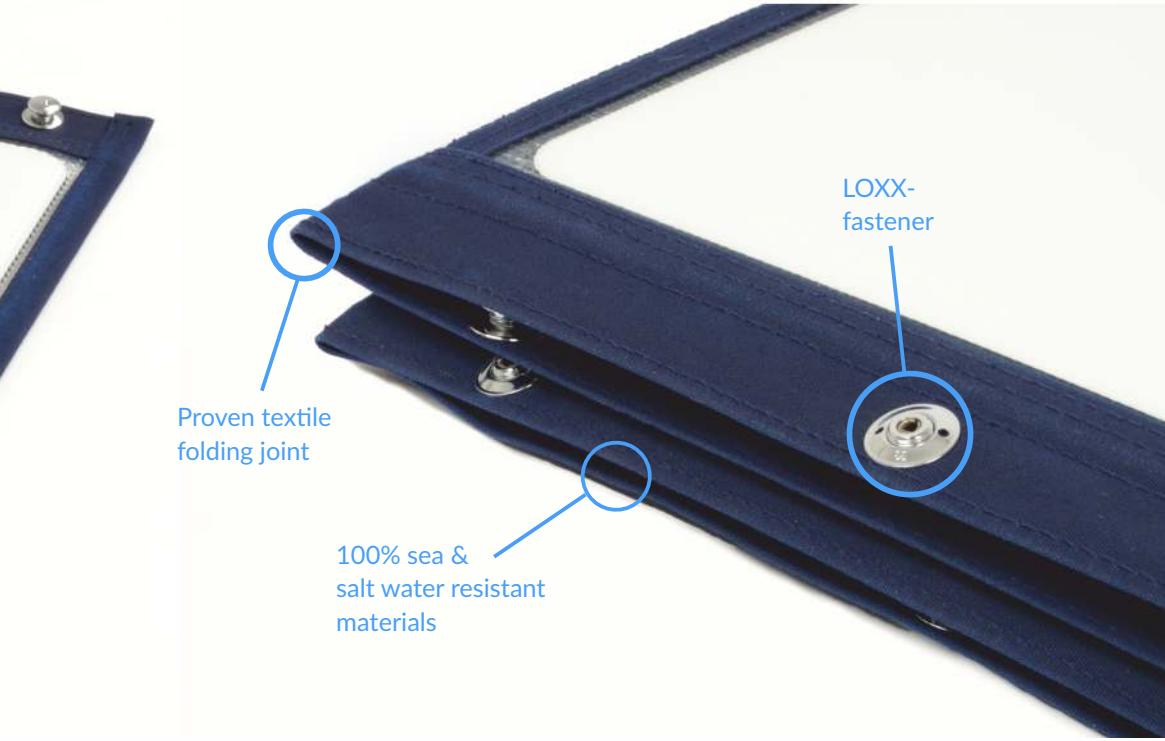
1- to 4-Wing Panels with Textile Edge

TX-Solar Panels

Solar energy on board without permanent installation of the panels by drilling or gluing? Tarpaulin, sprayhood and bimini offer excellent, so far unused surfaces for solar panels. How can they be used?

The SunWare innovation:
TX solar panels with textile edge for textile surfaces on board. Lightweight, flexible, foldable and to Go!
TX panels are made from materials that are light in weight, yet exceptionally strong, making them ideal for mounting on textile surfaces.
Special cell connectors absorb vibrations to provide long-lasting protection – on the bimini and when transporting the folded panel.

Depending on the rating class, the panels consist of 1, 2 or 4 wings that can be folded for easy transport.
TX solar panels are designed with a tough tarpaulin surround.



Soft Tarpaulin Surround for Mounting on Textile Surfaces/ Coverings

Provided with LOXX fasteners (standard design), the panel is easy to clip onto sprayhood or bimini. Each panel comes with the relevant LOXX base parts for secure fastening on bimini, tarpaulin or sprayhood.

Special attention was paid to the panel fittings. Every TX panel comes as standard with a 10 m cable, cable ties, waterproof plug and socket, cover cap, LOXX base parts, sealing washers, punching tool – everything you need for secure fastening. By car or plane, your TX panel is a light-weight, easily stowable companion when travelling to your boat.

Once the tarpaulin or bimini is provided with LOXX base parts, you can fasten your TX solar panel in a few simple steps. When you're ready to leave your boat again, simply detach the panel from the bimini and fold it back up for transportation or stowing below deck.

Solar Panels **TX/-TX+ Series**

12V system voltage — Dimension & Current Output

Panel Type	*Power*	*Dimension*	*Weight*	*Charge Current*
TX-42052 (+)	**240 Wp**	1164 x 1590 mm	10,9 kg	13,20 A
TX-42039 (+)	**180 Wp**	929 x 1590 mm	8,2 kg	10,00 A
TX-22052 (+)	**120 Wp**	1106 x 826 mm	5,1 kg	6,60 A
TX-22039 (+)	**90 Wp**	873 x 826 mm	4,2 kg	5,00 A
TX-12052 (+)	**60 Wp**	1106 x 431 mm	2,6 kg	3,30 A
TX-12039 (+)	**45 Wp**	873 x 431 mm	2,2 kg	2,50 A
TX-120165	**60 Wp**	804 x 543 mm	2,6 kg	2,85 A
TX-120164	**45 Wp**	631 x 543 mm	2,3 kg	2,17 A

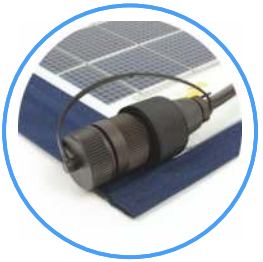
24V system voltage

TX-42252	**240 Wp**	1164 x 1590 mm	10,9 kg	6,60 A
TX-42239	**180 Wp**	929 x 1590 mm	8,2 kg	5,00 A
TX-22252	**120 Wp**	1106 x 823 mm	5,1 kg	3,30 A
TX-22239	**90 Wp**	873 x 826 mm	4,2 kg	2,50 A

Wp = Peak power (W) under standard conditions, irradiation 1000 W / m², 25 ° C

All TX+ panels: available with included expansion socket for parallel connection with other TX solar panels

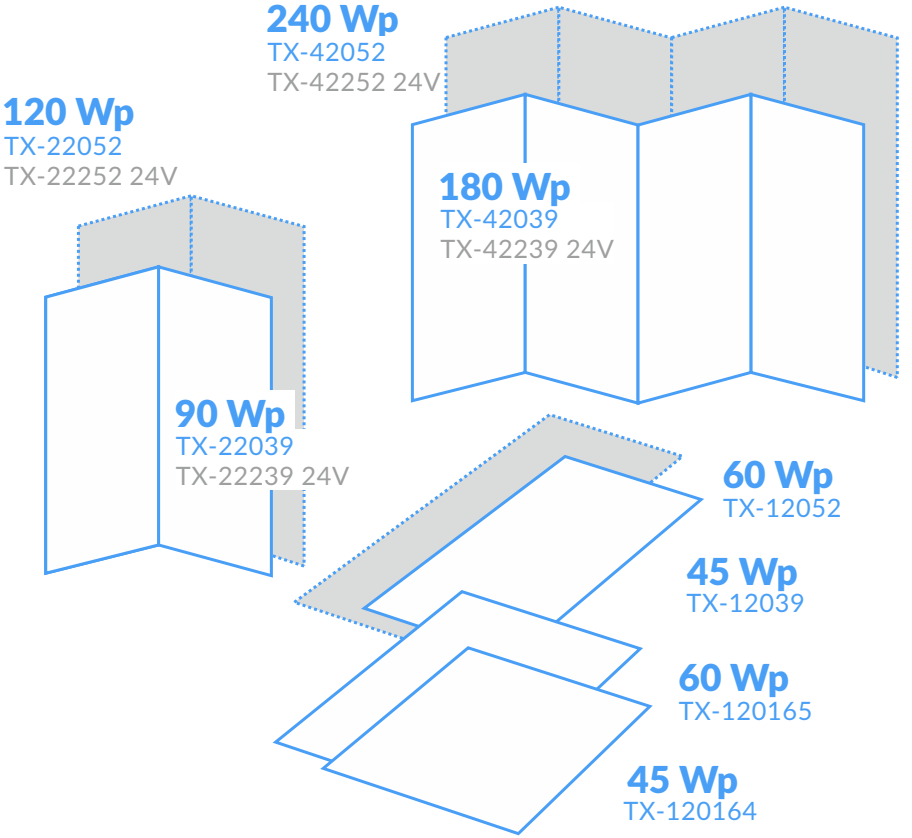
TX-Series
With Tarpaulin Surround, Foldable



Expansion socket
at TX+ panels

LOXX lower parts
with sealing washer

Assembly set
included



180 Wp
TX-42039

120 Wp
TX-22052

240 Wp
TX-42052

60 Wp
TX-12052

45 Wp
TX-12039

90 Wp
TX-22039

TX-Solar Panels for Bimini, Sprayhood & Rigging

1 to 4-Wing Panels with Textile Edge

- All 12V panels are also available with an expansion socket called TX+
- Tarpaulin surrounding for mounting on textile surfaces/ coverings
- Appropriate LOXX base parts for fastening are enclosed
- Multi-wing panels are foldable
- With 12V panels, each wing of a TX panel works as a separate panel, with 24V panels in pairs
- Waterproof plug and sockets are enclosed, for simple and quick release
- 100% sea & salt water resistant
- 1m connecting cable & 10 meter extension cable (3m at TX-11027) are included
- Partly also available as 24V version
- Non-Glass-panels with unbreakable Nowoflon front foil
- Light-weight core plate, 2mm aluminium sandwich, powder-coated, white, fully encapsulated in EVA
- Cable output screwed, sealed and 100% water proof
- Ultra flat panel construction (5mm), at cable output 22mm
- 100% maintenance-free, self-cleaning surface
- 3 years warranty

Technical details & drawings at: en.sunware.solar/serie-tx

TX-Series
with Textile Frame
Foldable

For Textile Surfaces on Deck
& for Mobile Use

TX sprayhood set

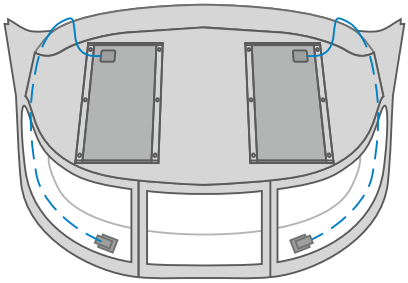
Ideal for sprayhood mounting

TX-Sprayhood Panels

The sprayhood on board is permanently installed on almost all boats and offers an excellent place for solar panels to cover the boat's power requirements.
A solar sprayhood solution provides enough power for the navigation system, lights and refrigerator.
As the main boom often shades the middle section of the sprayhood, the powerful TX sprayhood panels are mounted either to the left or right for optimum energy yield – the middle section of the sprayhood remains clear. To avoid glare when looking over the sprayhood, the panels are completely black.

For typical 30- to 38-foot yachts from Bavaria Yachtbau GmbH or Hanse-Yachts AG, TX sprayhood panels are the simplest solution for a permanent solar power supply.

The panels are available with cable outlets on the left and right (for port/starboard).
Fitted with LOXX fasteners, the TX panels can be easily removed.
The cables are routed along the frame – with a deck feed-through (such as the waterproof push-fit deck feed-through) for each panel next to the companionway.



Illustrative installation:

Panels sit fully flush on the sprayhood
! Do not position panels on the support frame !

Solar Panels **TX-Sprayhood Series**

12V/ 24V system voltage

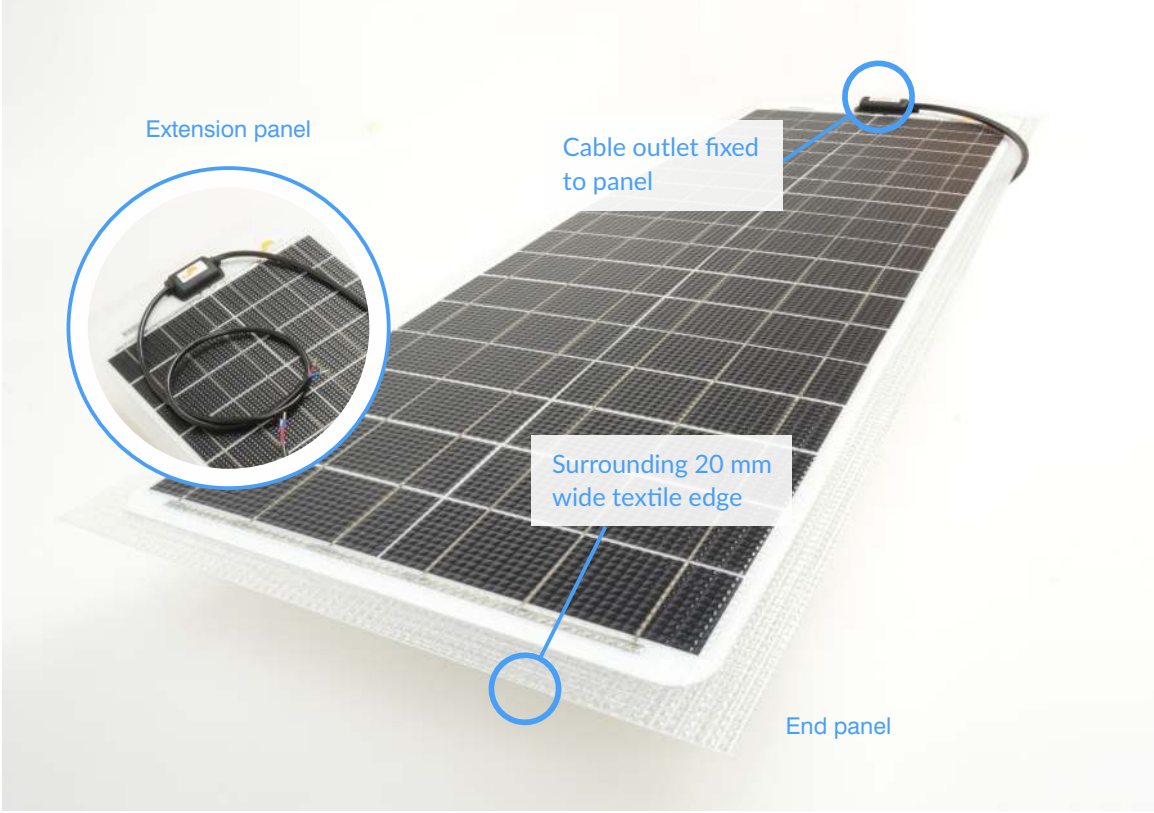
Dimensions & Current Output

Panel type	*Power*	*Note*	*Dimensions*	*Weight*	*Charge Current*
Sprayhood set	**120 Wp**	left + right	804 x 543 mm	5,2 kg	5,70 A
Sprayhood set	**90 Wp**	left + right	631 x 543 mm	4,6 kg	4,34 A
TX-120165	**60 Wp**	right	804 x 543 mm	2,6 kg	2,85 A
TX-120265	**60 Wp**	left	804 x 543 mm	2,6 kg	2,85 A
TX-120164	**45 Wp**	right	631 x 543 mm	2,3 kg	2,17 A
TX-120264	**45 Wp**	left	631 x 543 mm	2,3 kg	2,17 A

Wp = Peak power (W) under standard conditions, irradiation 1000 W / m², 25 ° C

The sprayhood sets include:
- 2 panels with mirrored cable outlets (left and right)
- 2 push-fit deck feed-throughs
- LOXX bases with sealing washers
- Punch

Single panels include:
- LOXX bases with sealing washers
- Punch



Custom on-site integration by your canvas maker

SX-Solar Panels

The surrounding 20 mm wide fabric edge gives your canvas maker on site the option of integrating the SX series solar panels into your sprayhood or bimini as either fixed or detachable panels.

Detachable connections can be provided with zip fasteners, hook-and-loop tape or piping strips. Your canvas maker can also incorporate the cable duct and the push-fit connections into the fabric.

The panel comes with a fixed cable outlet as standard to ensure long-term water proofing and reliability.

Two panel sizes with 45 Wp and 60 Wp are available, in versions with one and two connection cables.
SX solar panels with one cable are end panels, panels with two cables are extension panels.
In 12V systems, several extension panels – up to 16A per line – can be connected in series. The last panel in each line is an end panel with a connection cable.
For 24V systems, an end panel must be combined with a 24V extension panel. The internal series connection does not allow for any further panels in the line.

SX-Series
For Upholsterers & Canvas makers

For sewing into or onto boat canvas

Directly sewn in

Hook-and-loop tape

Zip fastener

Solar Panels **SX-Series**

12V/ 24V system voltage

Dimensions & Current Output

Panel type	*Note*	*Power*	*Dimensions*	*Weight*	*Charge Current*
SX-12852	End panel	**60 Wp**	1104 x 373 mm	2,1 kg	3,30 A
SX-12852+	Extension panel	**60 Wp**	1104 x 373 mm	2,3 kg	3,30 A
SX-22952+	24V Extension panel	**60 Wp**	1104 x 373 mm	2,3 kg	3,30 A
SX-12839	End panel	**45 Wp**	873 x 373 mm	1,8 kg	2,50 A
SX-12839+	Extension panel	**45 Wp**	873 x 373 mm	2,0 kg	2,50 A
SX-22939+	24V Extension panel	**45 Wp**	873 x 373 mm	2,0 kg	2,50 A

Wp = Peak power (W) under standard conditions, irradiation 1000 W / m², 25 ° C

Mounting instructions:
- Minimum stitch spacing 8mm
- Minimum seam distance to carrier plate 6mm
- Panels must be fully supported by taut fabric
- Panel carrier plate must not rest on the frame (buckling risk)
- Panels must be protected from vibration and heavy impact

Installation instructions, technical details & drawings at: en.sunware.solar/serie-sx

Solar Panels
RX-Series

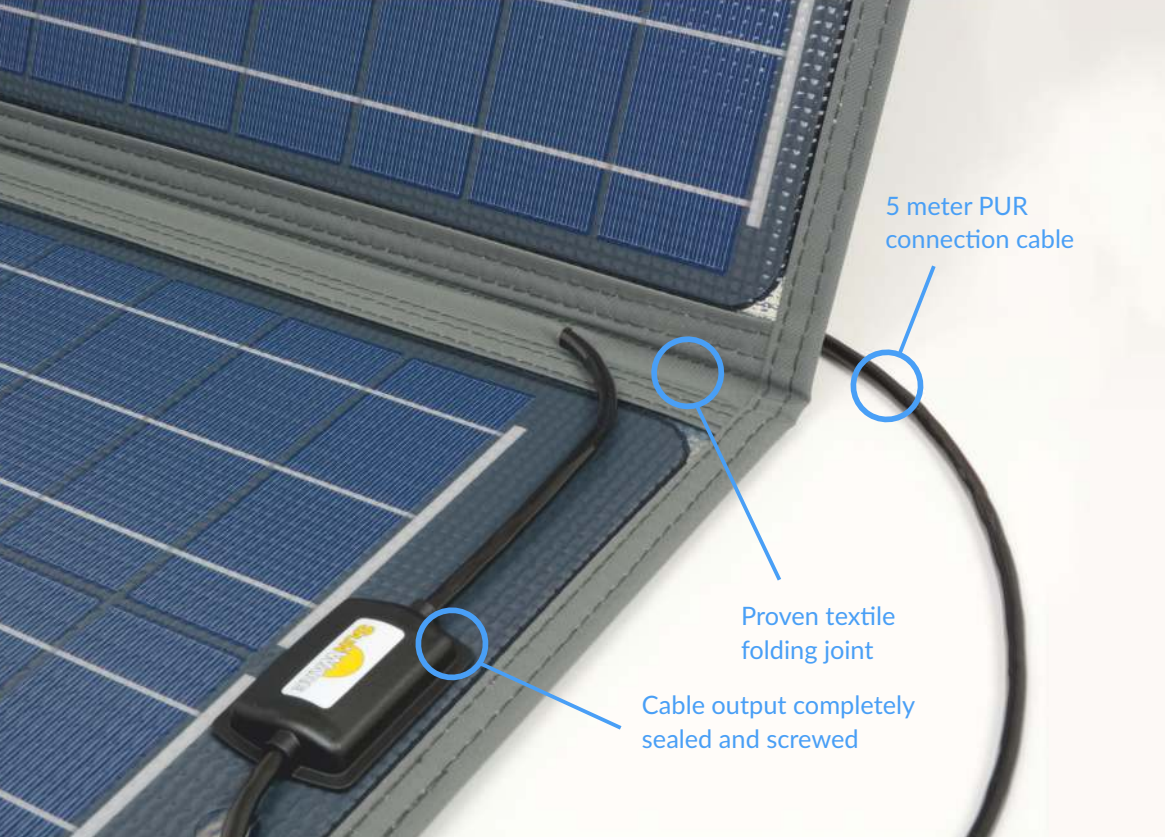
Plug & Play Lösung für mobile Anwendungen

Unpack panel, plug in controller – done!
One panel for many applications. Be it boat, caravan, holiday home, off-road or outdoors, simply plug the panel with the controller into a 12V socket, and you're ready to go. No installation necessary!

RX panels can be folded to a convenient size for easy transport and storage on travels. The folded panels are designed to protect the cells tucked inside. Several 9mm eyelets around the textile edge allow fastening of the panel in a variety of ways using tent pegs, rope, bungee cords, etc.
The panel comes with an integral 5m cable, which can be extended by an optional plug-in ready 5m extension cable, ensuring optimal positioning of the panel in the sun for maximum efficiency while the vehicle is parked in the shade.

Photo: defender2travel

Solar To Go for **Allrad, Offroad** and **Outdoor**



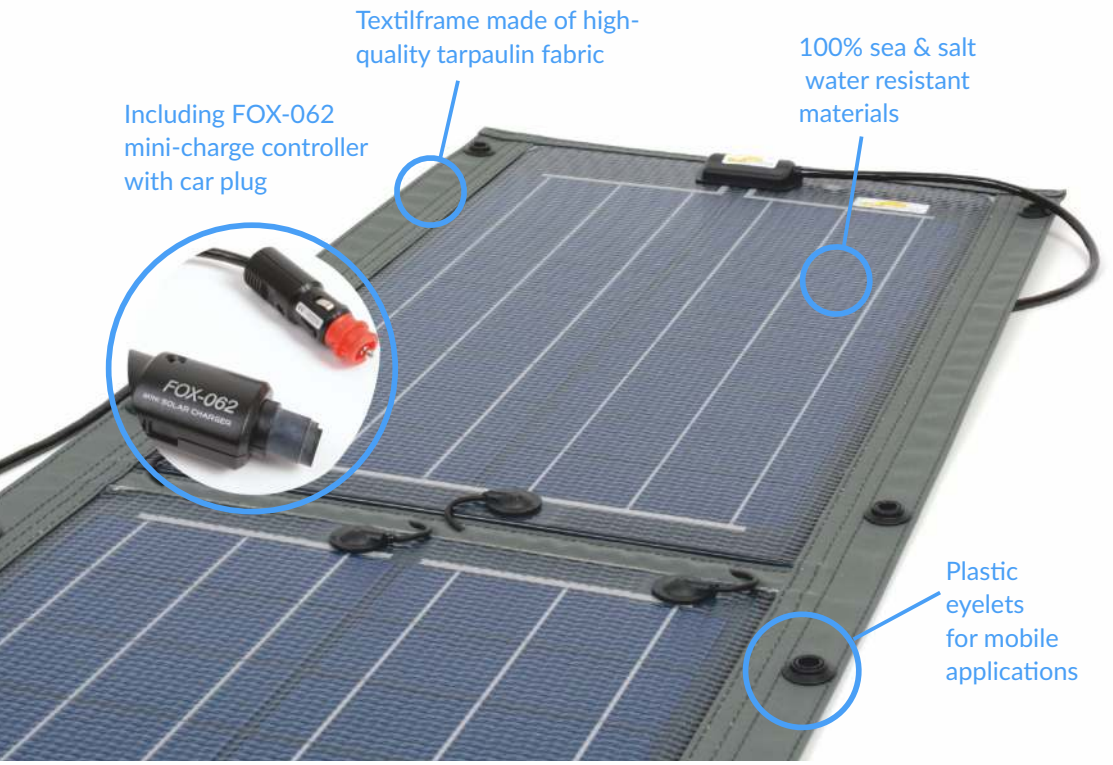
Foldable Plug & Play Solar Panels

RX-Solar Panels

Unpack panel, plug in controller – done!
RX series panels are designed as a plug & play solution with charge controller. Simply connect the controller to a 12V socket or 12V cigarette lighter and plug the panel cable into the controller to charge the battery. No installation necessary!

The ideal travel companion
The RX-series has 9 mm eyelets all around for easy attachment. Each panel comes with the appropriate controller with car plug to charge AGM, GEL, Lead-acid and LiFePO4 batteries.
The cabling is designed and tested to withstand thousands of bends. Each panel is double-stitched into the robust textile frame.

RX panels can be folded to a convenient size for easy transport and storage on travels.



RX Panels – Unpack, Plug in – Done, incl. Plug-In Charge Controller

With the 12V RX-22052 and RX-22039 solar panel, both wings of the panels work completely independently of each other.
Shading on one wing does not affect the power outputof the other of the panel. With 24V RX panels and RX-21052 panel, both wings are connected in series. The maximum energy yield is achieved when both wings are aligned in the same direction to the sun.
Several RX solar panels can charge the battery at the same time without any problems. The individual solar panels and controllers do not influence each other.
Panels with different outputs can also be easily combined with each other. In addition to an existing, permanently installed solar system, RX solar panels can easily be used to increase the power output.

TIP: Take an RX panel with you when you hire a caravan or charter a boat.
A single RX-22039 or RX-22052 solar panel generates enough electricity to power your refri-gerator, for perfectly chilled drinks at any time.

Solar Panels **RX-Series**

12V system voltage — Dimension & Current Output

Panel Type	*Power*	*Dimension*	*Weight*	*Charge Current*
RX-22052	**120 Wp**	1106 x 826 mm	5,1 kg	6,60 A
RX-22039	**90 Wp**	873 x 826 mm	4,2 kg	5,00 A
RX-21052	**60 Wp**	1265 x 431 mm	2,6 kg	3,30 A

24V system voltage

RX-22252	**120 Wp**	1106 x 826 mm	5,1 kg	3,30 A
RX-22239	**90 Wp**	873 x 826 mm	4,2 kg	2,50 A

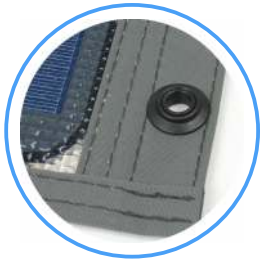
Wp = Peak power (W) under standard conditions, irradiation 1000 W / m², 25 °C

The charge controller FOX-062 is included in the scope of delivery for all RX panels.
Its integrated LED shows the state of charge of the connected battery and provides reliable protection against overcharging. Reverse current protection is also integrated.

Technical details & drawings at: en.sunware.solar/serie-rx

RX-Series
Plug & Play Panels, Foldable

Foldable



Plastic eyelets

Mini charge controller incl.

Foldable Panels with 2 Wings
with Mini Charge Controller & Car Plug

- Plug & Play panels, ready to plug in
- Foldable, light weight and robust
- Each wing of RX-22039 and RX-22052 working independently
- At RX-21052 and the 24V panels two wings are connected in series
- Textile edge with 9 mm eyelets for easy attachment
- 5m connection cable with SureSeal-plug
- Charge regulator FOX-062 with car plug for socket and cigarette lighter
- Charge controller FOX-062 must be protected against humidity
- PERC high-performance solar cells
- Non-glass solar panel, shatterproof, with ETFE front film
- Partly also available as 24V version
- 100% sea- & salt water resistant
- Light-weight core, made out of 2mm aluminium sandwich, dark-grey, fully capsulated by the laminate
- Cable output screwed, sealed and absolutely water proof
- Ultra flat panel construction only 5mm thick, at cable output 22mm
- 100% maintenance-free, self-cleaning surface
- 3 years warranty


Photo: defender2travel


Photo: Per Ragnar Schjelderup

RX-Series
Eyelets for Attachment

For Mobile Applications

Robust
and **Long-Lasting**
FOX- Charge Controllers

Multi-stage charging characteristic & proven worldwide

Long-Lasting Construction & High Quality Materials

FOX charge controllers have proven their efficiency in decades of use.
We have systematically enhanced the charge algorithm for the gentle and highly efficient charging of your battery systems.
By combining advanced technology with sturdy components, FOX charge controllers are 100% reliable, safe and long-lasting. Especially on board, there are often high battery capacities. FOX charge controllers protect your battery system, both on long journeys and while you are absent.

SunWare charge controllers use stainless steel terminals for cables of up to 16 mm^2. Thus even large charge currents are conducted to the batteries without losses. The large heat sinks of FOX charge controllers enable the operation even at high indoor temperatures, such as are usual on a boat or in a caravan.

Made to last, FOX charge controllers have operated reliably for decades. Simply install and leave to run.

Compact
and **Efficient**

FOX-320 for
2 Battery-Systems

FOX-220 for
1 Battery-System

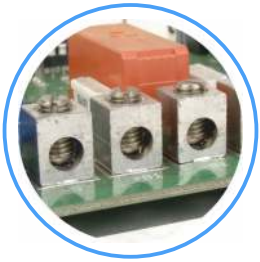
Solar Charge Controller with LED Display

FOX-X20-Series

These FOX charge controllers feature an LED display showing the battery condition and system status. The compact controllers are installed in the vicinity of the batteries. FOX-X20 charge controllers are free of maintenance and designed for decades of operation.

FOX-320 and FOX-220 are solar charge controllers for panel currents up to 22A and suitable for AGM, GEL and Lead-acid batteries. The FOX-320 is a dual battery solar charge controller with the capability to charge two battery systems independently (house/engine). Integrated deep discharge protection is designed for currents up to 20A.

The controllers can be connected to the optional remote display FOX-MD1 using a prefabricated cable. Controller and display can be mounted at a distance of up to 10m. The FOX-MD1 displays the exact voltages and currents and allows you to program various parameters, such as battery type and charge ratios.



Terminals
16 mm²

Extra large heat sink for
high ambient temperatures

Extendable with remote
display FOX-MD1

Charge Controller with LED Display

Extendable with FOX-MD1

- LED display for the state of charge of the battery & charging current
- Overcharge protection 22A, is equal to solar panels of 380 Watt, 12V (760 watt @ 24V)
- Adaptive deep discharge protection
- Automatic 12/ 24V detection
- **FOX-320 for 2 battery banks**
- Loads are supplied always of battery 1
- Extendable with remote display FOX-MD1
- Night light function adjustable (max. 20A), shut-off threshold adjustable via FOX-MD1
- for AGM, GEL and Lead-acid batteries

FOX-X20-Series

12V/ 24V system voltage

Controller	*Batteries*	*Solar Power @12/ 24V*	*Charge Current*	*Dimensions*
	quantity	*max.*	*max.*	*L x W x H*
FOX-220	1 system	380 W/ 760 W	22 A	107 x 126 x 55 mm
FOX-320	2 systems	380 W/ 760 W	22 A	107 x 126 x 55 mm

Technical details & drawings at: en.sunware.solar/fox-x20

Elegant
and **Compact**

Remote Display & Programming Unit for FOX-220/320

FOX-MD1

The controller is connected to the remote display FOX-MD1 using the prefabricated cable supplied. Plug in the cable at either end – done!
Controller and display can be mounted at a distance of up to 10 meter.

The FOX-MD1 (remote display and programming unit) displays measured values and allows you to change the battery type and charge parameters, such as battery selection (AGM, GEL, Lead-acid) or charge ratio B1 to B2 (e.g. 90% to 10%). The high contrast, 2-line display shows the present charge current (Ic), solar current (Is), discharge current (IL) and the battery voltage. An arrow on the display indicates which battery is currently charged.

Thanks to the large backlit display, the data are easy to read even in dark environments.

Incl. mounting frame

Incl. 5 meters connection cable

Extra large display with backlight

Remote Display & Programming Unit

Plug'n Play Extension for FOX-220/ 320

- Remote display for FOX-220/ FOX-320
- 2-line display with 20 characters
- Backlit display
- Clear menu navigation for easy operation
- Extensive data displays & setting options
- Charge ratio from B1 to B2 adjustable
- Display of current
  - charging current (Ic)
  - solar power (Is)
  - discharge current (IL)
  - battery voltage
- Suitable as built-in and surface-mounted device, surface-mounted housing always included
- Connection cable with 5m length is included

FOX-MD1

12V/ 24V system voltage

Remote Display	*Fitting to*	*Mounting Type*	*Cable Length*	*Dimensions*
FOX-MD1	FOX-220/320	built-in/ surface mounting	5 meter	150 x 58 x 34 mm

Technical details & drawings at: en.sunware.solar/fox-x20

Compact
Everything **in View**

FOX-360
for 2 Battery Systems

FOX-260
for 1 Battery System

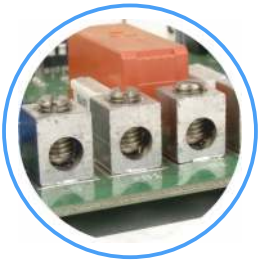
Solar Charge Controller with Display

FOX-X60-Series

Convenient operation, easy installation and a variety of display features are characteristic of the FOX-X60 controller series.

The illuminated display with large lettering is exceptionally easy to read over an unusally wide viewing angle – even in low-light conditions.
Information shown on the display includes the battery voltages, charge/discharge currents and the power generated by the panel. Alternatively, battery levels can be read off bar charts. All data is quick and easy to access via the keyboard.

Special charge characteristics are available for GEL, LiFePO4, Lead-acid and AGM batteries – the battery type can be specified individually for each battery.
Overcharge and deep discharge protection are each designed for up to 22A, the deep discharge protection is designed for 20A.



Screw terminals
16 mm²

Extra large heat sink for
high ambient temperatures

Extra large display with
backlight

Adjustable Charge Controller

with Integrated LCD Display

- Display with backlight
- Programmable charge controller
- Overload protection 22A, corresponds to 380 watts solar panels at 12V (760 Watt @ 24V)
- Deep discharge protection or night light function adjustable (max.20A)
- System voltage 12V or 24V (automatic detection)
- **FOX-360 for 2 battery systems**
- Extensive data displays & setting options for:
  - battery voltage (B1, B2)
  - charging current (Ic)
  - generated panel current (Is)
  - power consumption (IL)
  - Battery charge status as bar graph
  - Charge ratio B1 to B2 adjustable (5/95% to 95/5%)
- Battery type separately adjustable on AGM, GEL, Lead-acid, LiFePO4

FOX-X60-Series

12V/ 24V system voltage

Controller	*Batteries*	*Solar Power @12/ 24V*	*Charge Current*	*Dimensions*
	quantity	*max.*	*max.*	*L x W x H*
FOX-260	1 system	380 W/ 760 W	22 A	107 x 126 x 55 mm
FOX-360	2 systems	380 W/ 760 W	22 A	107 x 126 x 55 mm

Technical details & drawings at: en.sunware.solar/fox-x60

Plug‘n Play

Plug'n Play Miniature Charge Controller with Car Connector

FOX-062

The FOX-062 is an advanced miniature charge controller for 12V and 24V solar systems.
The three-stage charging characteristic enables fast charging and perfect battery maintenance when fully charged. Despite its small size the overcharge protection is designed for a solar current of 6,6 A. Reverse current protection is integrated. ausgelegt.

Easy plug and play!

Simply plug the controller into the vehicle socket or cigarette lighter and connect the panel cable on the input side - ready!
The battery is instantly charged by the solar panel.

Charging characteristics can be set to Lead-acid, LiFePO4, GEL or AGM batteries.

Supplied with 1m adapter cable with Sure Seal plug for connection of conventional solar panels.

Backside / legend of charge level indicator

Switch for selection charging characteristics

Plug vehicle socket/ cigarette lighter

Plug'n Play Charge Controller

Ready to Plug in without Tools

- Overcharge protection 6,6 A, is equal to solar panels of approx 120 watt 12V, or 240 watt 24V
- Plug suitable for car cigarette lighter and 12V socket, thanks to the removable red adapter
- Car plug with integrated fuse (8A)
- Active reverse current protection
- System voltage 12V or 24V (automatic detection)
- 98% charging efficiency
- Battery type adjustable for AGM, GEL, Lead-acid and LiFePO4 batteries
- Incl. 1m cable with SureSeal plug for solar panel connection
- Ready to plug solution – usage without tools

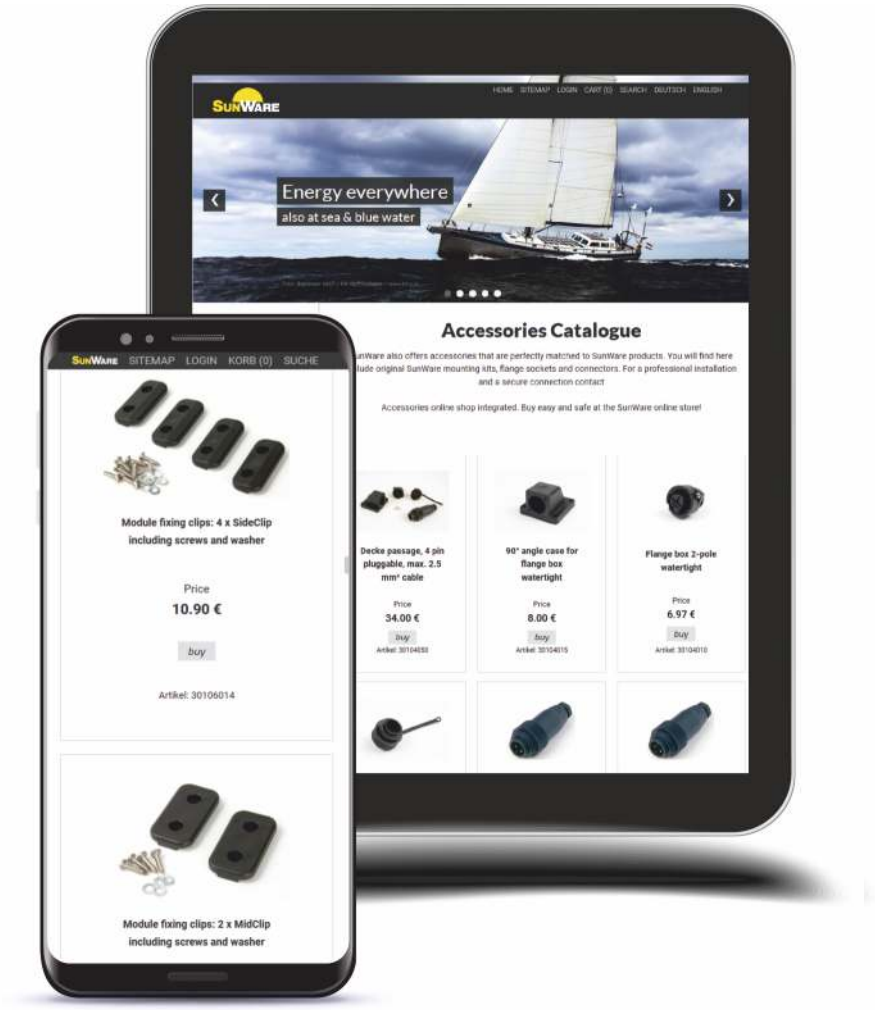
FOX-062

12V/ 24V system voltage

Controller	*Batteries*	*Solar Power @12/ 24V*	*Charge Current*	*Dimensions*
	quantity	*max.*	*max.*	*L x W x H*
FOX-062	for 1 system	120 W/ 240 W	6,6 A	50 x 70 x 30 mm

Technical details & drawings at: en.sunware.solar/fox-mini

Accessories for **Mounting** and **Connection**



Accessoires

Examples from the offer:

Cable 10m
2x1,5qmm

Panel bag blue
TX-x2039

Extension
cord 2-pin

Single component
PUR glue, black

Single component
PUR glue, black

LOXX set of 5

Panel fixing clips
4x SideClip

Accessories catalog at:
en.sunware.solar/products/accessories

SWITZERLAND

Avalanche blasting masts

Temperature: -40° C

Height: 4000m nN

STORY- I

When Reliability matters

Remote-Controlled Blasting for Avalanche Control

Avalanche towers are designed to trigger avalanches prophylactically with remote-controlled blasting. The towers have a deployment box that contains prepared explosive charges, which can be individually dropped by remote control. When the explosive charge is dropped, two igniters are pulled and the explosion is set off after a time delay.

A blasting installation must be extremely reliable and effective as well as easy to operate and maintain. This requires a consistent supply of solar power over months, particularly for the control unit of the dropping mechanism that triggers the explosion.

The conditions for an installation high up in the mountains poses special challenges to solar panels: the extremely low temperatures, in combination with intense UV exposure and the frequent temperature cycles over the course of the day cause many synthetic materials to become brittle and compromise the electrical connections within the panels.

Addressing this issue, SunWare has developed unique bonding techniques. In combination with special embedding materials within the panels and the use of an extremely UV-resistant front film, SunWare solar panels have mastered these challenges for many years now.

DUBAI

Coastal - Monitoring

Temperature: 50 ° C
Humidity: 70-80%
Water salinity: 4%

Photos: Osil

STORY- 2

Autonomous Marine Data Buoys

Coastal, Estuarine & Offshore Monitoring

Increasing demand on coastal resources has led to a greater demand for real-time monitoring of environmental factors such as waves, currents, tides and pollutants.
Many of these data are supplied in real time by monitoring and measurement systems for coastal regions. These buoys are deployed across the world under at times extreme conditions. Measurement buoys off the coast of Dubai are equipped with SunWare panels.

A challenge for any material – the temperatures in summer can reach up to 50° C in the shade, with humidity levels of 70% - 80% and a high salt content in the air.
These are conditions that few solar panels can cope with. SunWare has risen to the challenge and established itself for many years now as an accredited supplier to buoy manufacturers for worldwide use.

North pacific

The Ocean Cleanup

Temperature: 27 ° C

Humidity: 75%

Water salinity: 3,45%

STORY- 3

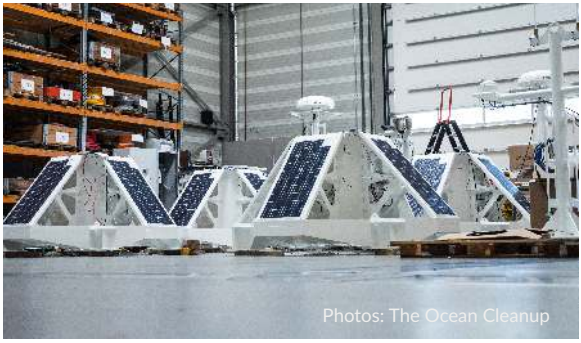
Ocean Cleanup

World's First Ocean Cleanup System Launched

Every year, millions of tons of plastic enter the oceans, of which the majority spills out from rivers. A portion of this plastic travels to ocean garbage patches, getting caught in a vortex of circulating currents. If no action is taken, the plastic will increasingly impact our ecosystems, health and economies.

„The Ocean Cleanup" has developed a passive cleaning method that utilises natural oceanic forces to collect the plastic already in the oceans quickly and cost-effectively.

With a full fleet of cleanup systems, 50% of the plastic in the Great Pacific Garbage Patch are aimed to be collected in about five years.



Photos: The Ocean Cleanup

In 2018, Boyan Slat, founder and CEO of The Ocean Cleanup project, performed the first live test 90 km off the coast of San Francisco in the Pacific Ocean.
The required energy for the measurement technology, the control and the propulsion systems of the floating barrier was generated by solar energy.

The solar panels were supplied by SunWare and were mounted to the technology platforms at the tube ends.
Photos: theoceancleanup.com

STORY- 4

Marine Environmental Monitoring

Federal Maritime and Hydrographic Agency

MARNET measuring buoys are found in the northern German Bight.
As semi-submersible buoys with a torus at 10 m depth, the buoys are gravity-stabilised by ballasting the torus with 60 tons of sea water.

SunWare solar panels are installed approx. 20 m above the sea surface. Waves, salt spray and water hammer pose a particular challenge for the solar panels.
These automatic measuring buoys have various sensors on board, e.g. for temperature, salinity and oxygen content for different depths. The data collected is transmitted by satellite to the Federal Maritime and Hydrographic Agency (BSH) in Hamburg.
In operation all year round, the systems are powered exclusively by alternative energies (solar and wind).

Power or energy supply is a decisive criterion for these North Sea measuring buoys.

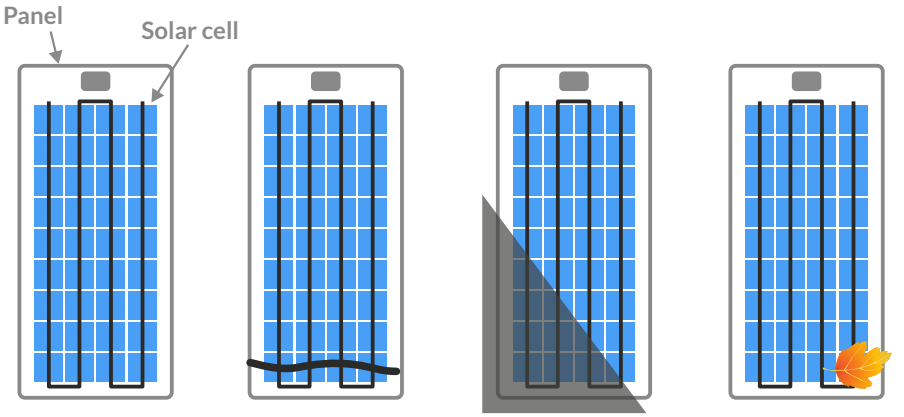
The MARNET monitoring network is used to monitor the North Sea in order to better record the effects on the climate and the much-discussed climate change. Data from the measuring buoy is fed into the BSH's data models for long-term forecasts. With reliability of the buoys a top priority, the BSH relies not only on wind energy, but also on SunWare solar panels!

Photos provided by: Federal Maritime and Hydrographic Agency (BSH)

What You Should Know!

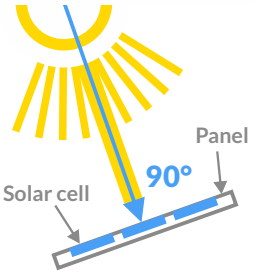
Power Supply at Partial Shading

Important: Make absolutely sure that no sub-areas of the panel are shadowed.
All cells of a panel are connected in series - the weakest illuminated cell limits the performance!
See the following sketch:

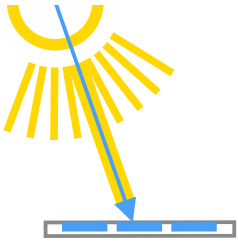


Panel without any shading	Line directly on panel 10% hard shadow	Diffuse shadow, e.g. from sail	A cell completely covered
Power **100%**	Power ca **90%**	Power ca **20%**	Power ca **10%**

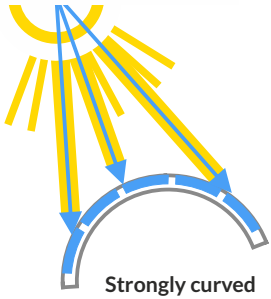
Einfluss des Einfallswinkels auf Leistungsabgabe



Vertical sunlight
Leistung: **100%**



Incidence angle of the sun:
70° -> Leistung: **94%**
60° -> Leistung: **87%**



Strongly curved panel, angle of incidence is different at each cell, between 90 ° and 10 °
Leistung: **10%**

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