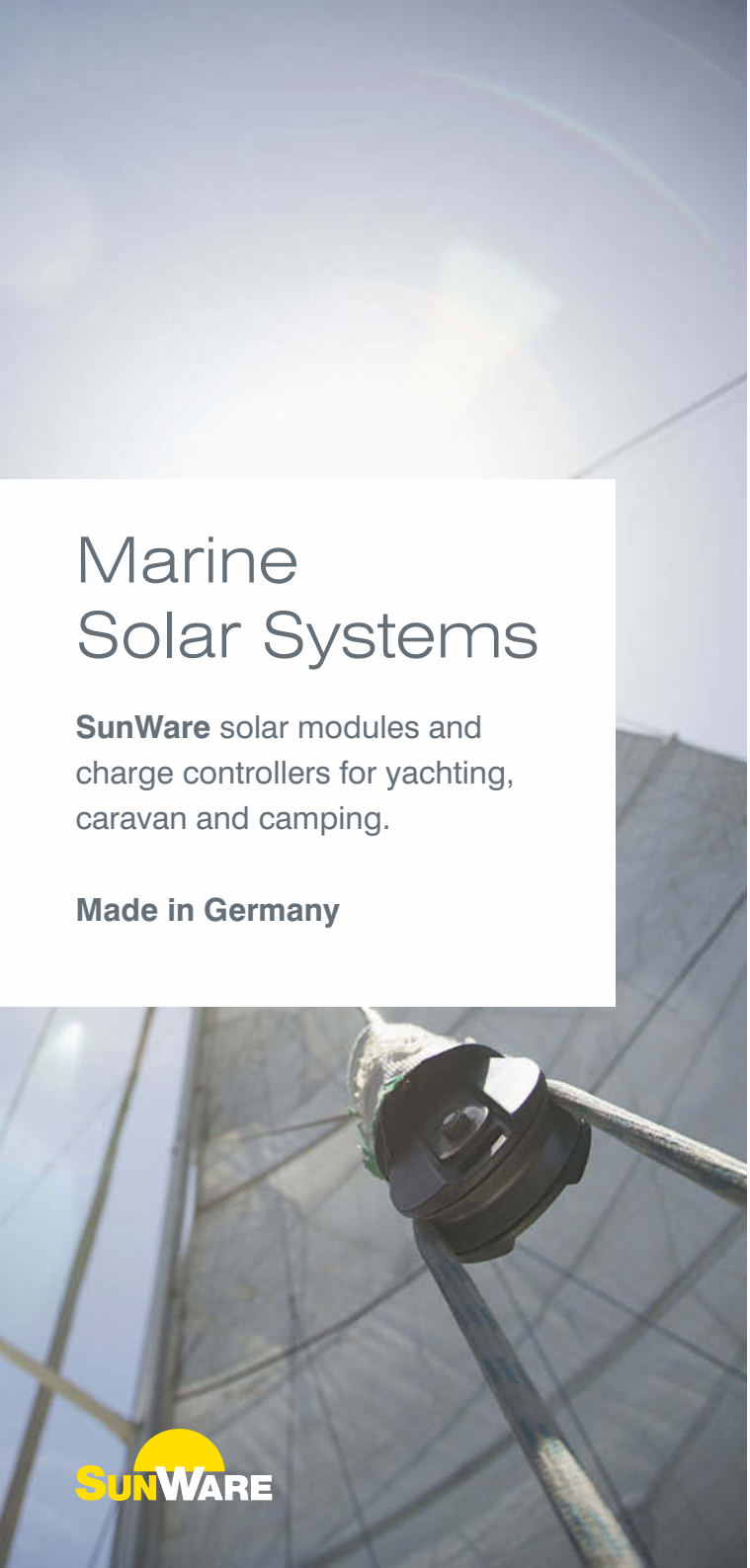
SUNWARE
SOLARTECHNIK GmbH & Co KG
PHOTOVOLTAIK
MADE IN GERMANY

Marine solar systems



Marine Solar Systems

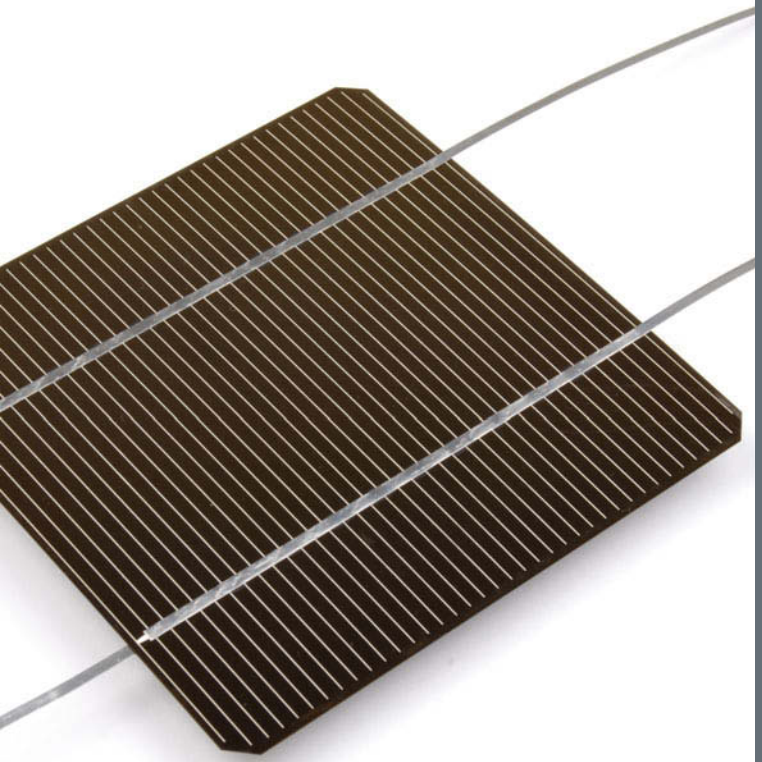
SunWare solar modules and charge controllers for yachting, caravan and camping.

Made in Germany

__SunWare__ solar systems are designed for the harsh daily routine at sea. Since 1987 solar modules and charge controllers are specifically developed for sea water applications. This experience of many years is the basis for the excellent quality of all SunWare products, which have proven their worth in global use.

Content:

In the beginning, there is the Light!



„A solar cell is a solid state device that converts the energy of sunlight directly into electricity by the photovoltaic effect ."
Source: Wikipedia 2012

How a solar system works

The core of every solar module is the solar cell that converts light directly into electric power. Depending on the manufacturing process, there are mono-crystalline, multi-crystalline and thin-layer cells.

The characteristic efficiency of crystalline cells is 16% - 18%, only in exceptional cases up to 22%. Thin-layer solar cells on the other hand achieve efficiencies of only 6% - 10%.

In the case of 12V solar modules, 36 to 42 cells are connected electrically into a chain. Depending on the energy demand, several modules can be interconnected.

The solar modules charge the batteries. A charge controller, connected between module and battery, protects the battery against overcharge and discharge and maintains the battery.

Note on the planning of solar systems:
The energy yield generated daily must be in line with the daily consumption and the size of the battery. Additionally, strong seasonal variations in the energy yield must be taken into consideration.

Maud Fontenoy

Pacific, 119° 17' W, 21° 24' S.
The nearest port is 2.000 nm away:
Now you need materials you can rely on.

***Maud Fontenoy** is the first woman to have sailed around the world against winds and currents from La Réunion to La Réunion in 2006.*
On board: SunWare solar modules SW-3666, SW-6955 and FOX-350.

Why SunWare?

We exclusively use crystalline solar cells with the **highest performance class**. For the small available room on board requires maximum efficiency.

SunWare deliberately dispenses with dangerous glass surfaces on board. In our modules we use – by conviction – **Nowoflon**, a fluoropolymer film. Nowoflon features the same transparency as solar glass and is extremely UV resistant due to its fluor level.

The difference: Nowoflon is absolutely shatter-proof. No shards and no risk of injury. Though our Nowoflon film is significantly more expensive than glass, it offers far greater safety and reliability on board.

Sea and salt water

The average salt content of the oceans is 3,5%.
Quite a challenge for materials and manufacture.

SunWare qualitiy

salt and sea water resistant

All modules feature a 1mm thick mounting plate made from V4A stainless steel. The mounting plate is white powder-coated and completely encapsulated in Nowoflon. On the side, the laminate overhangs the mounting plate by approximately 5mm. This gives the mounting plate and solar cells long-lasting protection against the extremely corrosive sea water.

Each cable output is screwed and sealed – utterly water-proof. The UV resistant PU cable, flexible at low temperature, has a length of 3m.

Salina Schwörer 1 year old.
Born on Patagonia, lives on the TOPtoTOP sailboat.
The first steps of her life she carries on SunWare solar modules.

*The **TOPtoTOP Global Climate Expedition** is the 1st expedition over the 7-Seas to the 7-Summits that will be achieved by human and nature's power only.*
www.toptotop.org

SunWare qualitiy

Safe & non-slip

SunWare solar modules have a slightly structured surface to optain the anti-slipness effect, even when damp or wet.
At the same time the Nowoflon film is extremely soil-resistant. Even stubborn soil is simple washed away with the next rainfall.

Rounded corners and the extremely flat module design prevent any trip hazards. And with direct mounting on deck, by adhesive or screws, nothing can get entangled or jammed between module and deck.

Enjoy noiseless generating electricity on board

The right solar module for any application.
The SunWare range comprises numerous module types of various performance classes and dimensions. Each module has been developed, produced and individually tested by SunWare themselves.

SunWare 12V S-Series

for glueing and screwing

12V solar modules of SunWare can be installed on deck without rear ventilation, using either screws or adhesive. Circumferential drill-holes already exist in the mounting plate; the Nowoflon film on the back is specially pretreated for better adhesion of the adhesive. We recommend the use of 1-K polyurethane adhesive.

Type	Wp	Dimensions	Weight
SW-3061	12	467 x 249 x 5 mm	1,2 kg
SW-3062	18	642 x 249 x 5 mm	1,7 kg
SW-3063	24	467 x 459 x 5 mm	2,3 kg
SW-3064	36	638 x 459 x 5 mm	3,1 kg
SW-3065	48	838 x 499 x 5 mm	4,5 kg
SW-3066	70	638 x 890 x 5 mm	6,1 kg

space-saving & powerful compact modules

SW-5066

SW-5065

Side-Clips

SunWare
12V K-Series
space-saving & powerful

We have optimised our compact modules in terms of dimensions. To save space, the cable output is positioned in place of a solar cell. Thus the edge width of the modules is significantly smaller at the module head.
To optimise the module size even further, we dispensed with the circumferential drill-holes.

Compact modules can be installed on deck using adhesive; the rear of the modules is already pretreated for the adhesive.
Alternatively, the modules can be fixed using Side- or Mid-clips.

Type	Wp	Dimensions	Weight
SW-5065	**48**	780 x 460 x 5 mm	4,0 kg
SW-5066	**69**	600 x 890 x 5 mm	5,4 kg

The specialists solar modules 24V

SW-3266

SW-3265

***24 Volt systems** are increasingly used on yachts and by now even in caravans.*
In response to this, SunWare has developed two 24 Volt solar modules.
***Advantage:** easier installation, no external serial connection required.*

SunWare 24V S-Series

for glueing and screwing

The mounting plates of our 24V modules also have circumferential drill-holes, thus allowing their installation on deck using either screws or adhesive. The Nowoflon film on the back is specially pretreated for better adhesion of the adhesive. We recommend the use of 1-K polyurethane adhesive.
80 high-efficiency solar cells guarantee maximum output for all 24V systems, even without rear ventilation.

Type	Wp	Dimensions	Weight
SW-3265	**48**	838 x 499 x 5 mm	4,4 kg
SW-3266	**69**	638 x 890 x 5 mm	6,1 kg

An exemplary solution for aesthetically sophisticated solar module integration: R-series modules were directly built in at the shipyard here.

R-Series modules 12V

With rear cable outlet

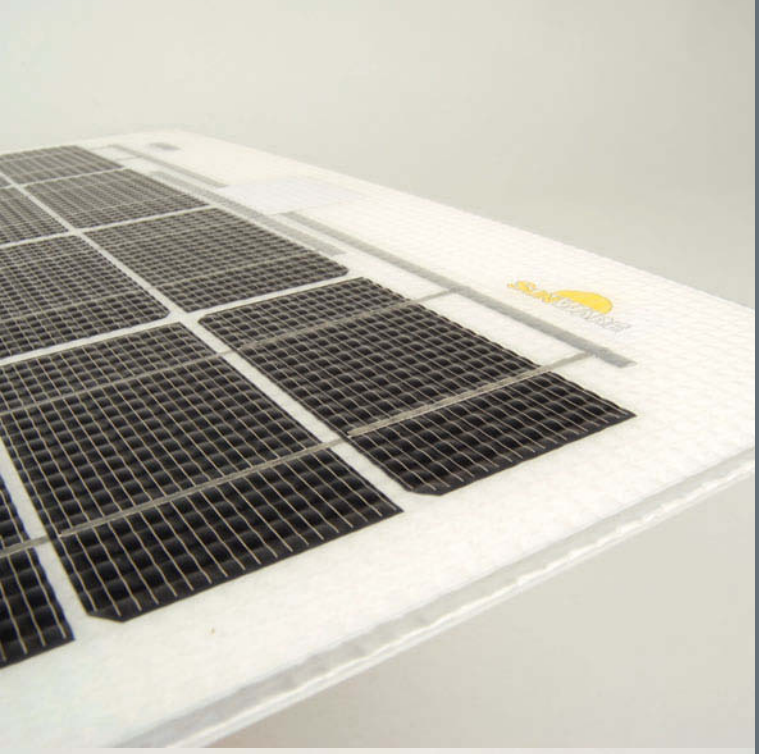
Elegant yachts use convincing SunWare modules with rear cable outlets. All cables disappear below deck – on-board aesthetics are not marred by deck bushings or cables.

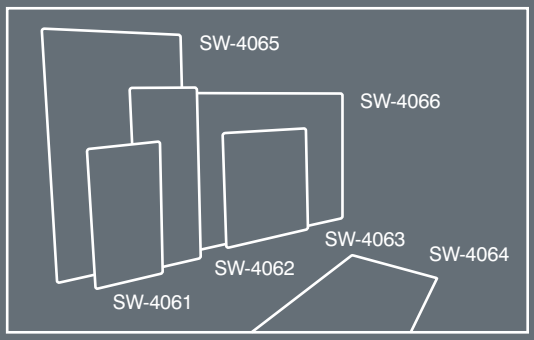
The R-series can be walked on with boat shoes and perfectly conforms to the curvature of the ship's deck.

A potential application for the R-series is provided if you can integrate a cut-out/ recess in the deck for the rear cable outlet.

Dimensions and technical structure are identical with our S-series. Modules are resistant to saltwater and seawater and were specially developed for ship applications.

Workmanship is also of proven SunWare quality – made in Germany.





Module sizes: analogue to page 11

SunWare
12V R-Series
With rear cable outlet

In terms of dimensions and technical aspects, R-series modules are identical to S-series modules; however, the cable outlet is moved to the rear so that modules can be perfectly integrated into the roof/ deck.
Additional types of modules upon request.

Type	Wp	Dimensions	Weight
SW-4061	12	467 x 249 x 5 mm	1,2 kg
SW-4062	18	642 x 249 x 5 mm	1,7 kg
SW-4063	24	467 x 459 x 5 mm	2,3 kg
SW-4064	36	638 x 459 x 5 mm	3,1 kg
SW-4065	48	838 x 499 x 5 mm	4,5 kg
SW-4066	70	638 x 890 x 5 mm	6,1 kg

Photo: Glen Raven® Sunbrella®

TX_Solar modules
Solar energy on so far unused boat surfaces.

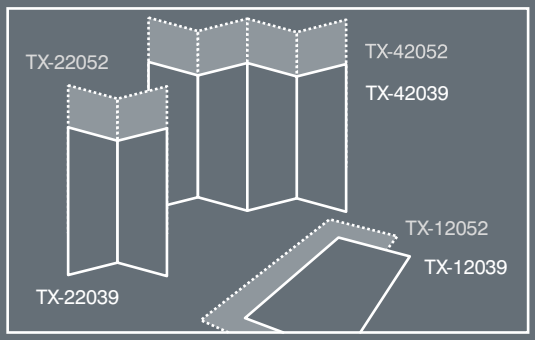
For tarpaulin, bimini, dodger and sprayhood.

TX_Solar modules
Foldable and with a textile frame

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

SunWare innovation: **TX_Solar modules** with textile frames for textile surfaces on board. Light-weight, flexible, foldable – simply 'to-go'!

TX_Solar modules are manufactured from materials characterized by low weight and special strength. They are optimally suited for textile fastenings.
Special cell binders will absorb vibrations and provide durable protection – on the bimini and when transporting the folded module.



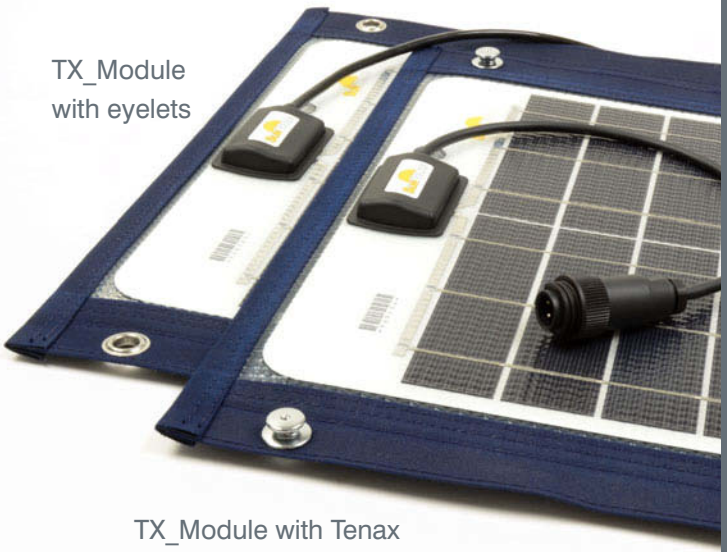
TX_Modules *with eyelets (10mm) or without fastening elements are also available upon request*

SunWare
TX_Solar modules
with 1, 2 or 4 wings

The **TX_Innovation** – SunWare solar modules with textile frames and foldable wings. Depending on rating class, comprising 1, 2 or 4 wings which can be simply folded for transportation.

TX_Solar modules are stitched into an extremely robust, textile frame. Provided with Tenax fasteners (standard design). Appropriate Tenax base parts for fastening on bimini, tarpaulin or sprayhood are enclosed with every module.

We paid special attention to the module fittings or accessories. As a standard, we included with every TX_Module: 10-meter cable, cable ties, waterproof plugs, sockets and a cover cap. Just all you need for fastening.



The weekend!
Get out of your car, walk over to the pier to your boat.
A 200 watt peak power TX module under your arm…

By the way: It's yet more convenient to carry your TX in its own TX bag.

Solar modules TX_series

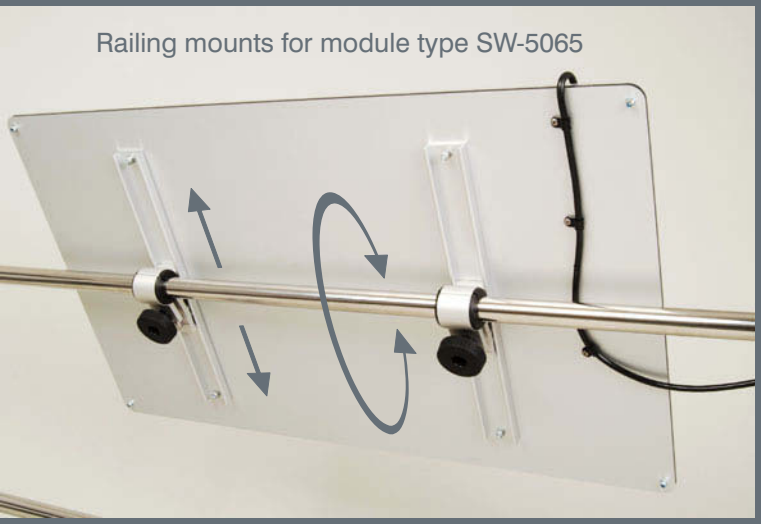
Foldable, light-weight and mobile

By car or plane – your TX_Module is a light-weight, easily stowable item when you travel to your boat.
Once tarpaulin or bimini are provided with Tenax base parts, you'll fasten your TX in a few simple steps. Leave your boat, take your TX_Module from the bimini and simply fold it up for transport or for stowing it below deck.

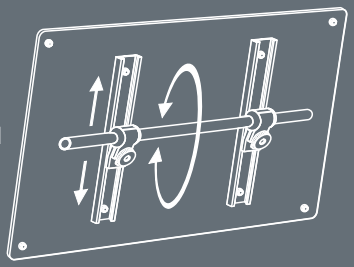
Type	Wg*	Wp	Dimension (LxW)	Weight
TX 12039	1	38	873 x 431	2,2 kg
TX 22039	2	76	873 x 826 (413)	4,2 kg
TX 42039	4	152	929 x 1558 (385)	8,6 kg
TX 12052	1	50	1108 x 431	2,7 kg
TX 22052	2	100	1108 x 826 (413)	5,1 kg
TX 42052	4	200	1164 x 1558 (385)	10,4 kg

** number of wings, dimensions in () = in folded condition*

Robust mount for better performance


Railing mounts for module type SW-5065

Including fastening materials. Solar module **not** included in the scope of supply.



The mounted module can be turned about the railing's tubular axis and clamped fast with a handwheel screw.
Sea and salt water resistant materials and its robust design permanently resist wind, weather and spray. Suitable for a pipe diameter 25 mm, other adapters are available.

SunWare Railing mounts

For module types SW-5065/ 3064

Use your railing to generate energy!
Thanks to SunWare railing mount, you can now perfectly align your solar modules to the sun.
Your advantage: You'll gain up to 20% more solar power compared to a conventional horizontal installation.

Type	Dimensions (LxW)	Weight
HR-5065	780 x 460 mm	2,2 kg
HR-3064	638 x 459 mm	2,0 kg

Ocean Fours NL, Ocean rowing New York to Bishop Rock.

On Board: Sextant, GPS, Sunware solar modules and FOX charge controllers

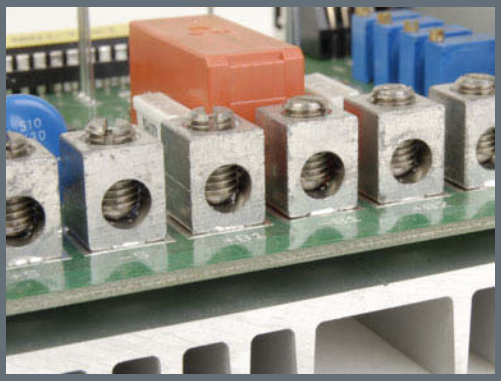
*The fastest unsupported row from USA to England was set in 2005 by **The Ocean Fours** (NL). They left New York on 27 May and crossed the Bishops Rock longitude 60 days, 16 hours and 19 minutes later.*

FOX charge controllers

Precision and high-tech

FOX charge controllers have proven their efficiency in 20 years 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.

Sturdy design & high-quality materials



Terminals made from VA for 16mm² cables - a stable connection.

Why charge controllers from SunWare?

All SunWare charge controllers use stainless steel terminals for cables of up to 16 mm². 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.
In many cases, 2 separate battery systems are on board (for the engine and the living space). For this application, SunWare has developed specific FOX charge controllers for 2 separate battery systems, which guarantee the gentle and highly efficient charging of batteries.

Series FOX-X20 High-tech for your battery

FOX-320
for 2 battery systems

FOX-220

FOX-MD1

FOX-320, FOX-220 and FOX-MD1
Thanks to remote display now even programmable – the essence of 20 years of experience and development.

FOX-320, FOX-220 and FOX-MD1

Precision and high-tech

In this FOX charge controllers, we have separated the display unit from the controller. Now the controller can be installed in the vicinity of the batteries.

The controller is connected to the optional remote display by a prefabricated cable (just insert cable at both ends - done!).
The distance between controller and display can be up to 10m. Due to the remote display and programming unit FOX-MD1, measured values can be displayed and battery types and charge parameters can be changed.
The backlit display and the membrane keyboard ensure greatest convenience for operation and reading. The controllers are designed to protect against 20A overcharges and 20A total discharges.
More technical data: see page 39

Series FOX-X60 Performance and Comfort

FOX-360
for 2 battery systems

FOX-260

FOX-260, FOX-360

The new SunWare controllers with integrated display are based on the technology of the FOX-X20 series. FOX-360 is designed for charging 2 separate battery systems.

Controller with graphic display

FOX-260, FOX-360

Comfortable operation and handling, ease of installation and manifold display features are the characteristics of the new controller FOX-260 and FOX-360.

The illuminated display with large lettering can be excellently read at particularly wide angles of view – even in low-light conditions. Battery voltages, charge/discharge currents, and module-generated power are displayed in detail. Battery charge conditions can also be alternatively read off bar charts. Values to be displayed can be accessed simply and swiftly via the keyboard.

Special charge characteristics have been developed for the battery types AGM, gel and lead acid – the type of battery can be individually determined for every battery. Overcharge and exhaustive discharge protection is designed for 20A respectively.
More technical data: see page 40

Functional
simple
more Overview

Current and Voltage Displays

FOX-D1 & FOX-D1/E

FOX-D1 and FOX-D1/E have been designed as universal digital displays. Available with flush or surface mount casing, they show the current battery voltage and the current charge or discharge current. Both are suitable for 12V and 24V systems of up to 20A.

Advantages: Particularly easy installation by means of integrated shunts. Minimum internal consumption (1.8mA only), the display can remain activated at all times. Possibility of switching between voltage and current display.
More technical data: see page 40

FOX-220, 320

Tech. Data	FOX-220	FOX-320
System voltage	12 V/ 24 V automatically	
Overcharge protec.	20 A	
Discharge protec.	20 A	
Nightlight-function	20 A	
Displays	3 LEDs	4 LEDs
For 2 batt.-systems	—	yes
Power requirement	12,0 mA	
Terminals	16 mm², VA	
Dimensions LxWxH	126 x 107 x 53,5 mm	
Weight	300 g	

FOX-260, 360

Tech. Data	FOX-260	FOX-360
System voltage	12 V/ 24 V automatically	
Overcharge protec.	20 A	
Discharge protec.	20 A	
Nightlight-function	20 A	
Displays	illuminated graphic LCD	
For 2 batt.-systems	—	yes
Power requirement	7,0 mA (18,0 illuminated)	
Terminals	16 mm², VA	
Dimensions LxWxH	128 x 107 x 53,5 mm	
Weight	300 g	

FOX-MD1

Tech. Data	value
Power requirement	3 mA
Backsheet illumination	50 mA, 10 Sek.
Max. cable length	10 m
Dimensions built-on	157 x 65,4 x 41 mm
Dimensions built-in	
Mounting frame	150 x 58,5 x 34,3 mm
Panel cutout	125,5 x 53,5 mm
Weight	150 g

FOX-D1, FOX-D1/E

Tech. Data	value
System voltage	12 V/ 24 V
Power requirement	1,8 mA
Voltage indicator	8 - 48 V
Current display	+/- 20 A
Dimensions FOX-D1	100 x 56 x 44 mm
Dimensions FOX-D1/E	
Mounting frame	115 x 78 x 35 mm
Panel cutout	56 x 84 mm
Hole distance	92 mm
Weight	120 g

About SunWare

Solar systems for Yachting, Camping & Caravans

Since our foundation in 1987, we develop and produce solar modules and charge controllers specifically for the harsh daily routine at sea. Our uncompromising quality demands fulfill the special challenges of sea/salt water applications.

Made in Germany

All SunWare products are developed, tested and produced by ourselves. In Germany! Even the high-performance solar cells of our modules are exclusively sourced from Germany. Only this way we can realise the SunWare quality demands of products and materials.

Quality check

We test our product quality daily:
Our in-house climatic exposure test cabinets and salt water spray systems test our modules using genuine North Sea water. Each individual solar cell is thoroughly tested for defects before it is finished by hand. And finally each product is tested and calibrated before dispatch.

Development and Research

In addition to the production of modules and charge controllers, SunWare is continuously working on the further development of new materials and components. Jointly with Akzo Nobel, we have, for example, developed a primer (bonding agent) for Nowoflon film, which we successfully use in our modules today.
For more than 20 years, SunWare solar modules are travelling the seven seas. And we can proudly say: they have proven themselves optimally!

SunWare is the specialist for stand-alone power supply on board.

You are at rough see and do have certainty that due to SunWare you have secure and reliable technology on board.
You anchor in a calm bay and enjoy the silence. In the Caribbean. In the Mediterranean. In the North Sea. Settle back and trust in our high-tech products.

Other production areas:
- OEM module manufactoring
- cutting of solar cells
- tabbing and stringing
- production of reference sensors

www.sunware.de

Dealer:

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