



Solar technology

**PRECISE CONTROLLING.  
EFFICIENT CHARGING.**



**Various controlling modes:**  
Shunt, serial, MPPT

**Including technical tips:**  
Things to know about solar technology

# PRICE MEETS PERFORMANCE/ OUR PROMISE

# VERSATILE SAFE PRECISE ROBUST INDIVIDUALIZED

Whether stationary or on the go – the solar controllers by IVT are versatile in their application. For the most divers deployment sites and all conventional battery types.

Deep discharge protection with automatic load shut-off, overload and overheating protection – with these and other protective functions you can always rely on your IVT solar controller.

For your valuable solar batteries an optimally controlled charging process is strictly required. Thanks to their precision IVT solar controllers always assure the best charging result.

The IVT solar controllers are so robust and well-worked that we grant a 3 year manufacturer warranty on all products.

Sometimes individualized solutions are necessary. We gladly modify our products to meet your expectations or produce products according to your requirements.

## Dear business partner,

The solar controller is the most important link between the solar module and solar battery, and thus the central controlling element of an autarchic stand-alone system - as it manages the entire system.

As a German family business with special branch-specific insider know-how IVT is well aware of the individual requirement each customer has regarding his solar controller. To cope with this, we offer a **wide spectrum of high quality devices** and **continuously refine our product range**.

Thus, at IVT you find solar controllers with:

- Various controlling technology (serial, shunt, MPPT)
- Most efficient charging characteristics for all conventional battery types (lead-acid, lead-gel, lead-AGM, LiFePO<sub>4</sub>)
- Useful adjustment possibilities and functions for an individualized application

With this, the solar controllers by IVT assure a **controlled charging process** with the **best possible charging result and optimum battery maintenance**.

Regarding user-friendliness we also have high expectations towards our products. The optionally available remote control units, for example allow for a comfortable controlling and monitoring as well as for the communication with the inverters of our DSW series.

For over 20 years, IVT offers you technical innovation in the scope of solar technology, inverters, voltage converters, charging technology as well as portable light - and that, at a fair cost-benefit ratio.

We are convinced that only technically innovative, durable and precise products deserve the brand IVT. You can rely on this!

With best regards

  
Reinhard Staudte  
Managing Director  
Product development

  
Helmut Staudte  
Managing Director  
Marketing/Sales

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# MPPTplus<sup>+</sup> SOLAR-CONTROLLER 12 V/24 V 10 A, 20 A, 30 A



## Sophisticated solar controllers of the newest generation

The MPPTplus<sup>+</sup> Solar Controller series consists from highly sophisticated solar controllers of the newest generation. Thanks to the microprocessor-controlled charging and MPPT regulation they are suitable for all common module technologies. By virtue of the MPPT function (**M**aximum **P**ower **P**oint **T**racker) it always makes the most efficient use of the solar power provided by the solar modules. The high efficiency grade (max. 97 %) and the significantly shorter battery charging time allow for the best possible power exploitation in your solar system.

## The most important characteristics and features

- Suitable for lead acid, lead gel, lead AGM and LiFePO<sub>4</sub> batteries
- Solar input voltage max. 70 V
- Automatic voltage recognition 12 V/24 V
- High efficiency grade max. 97 %

## Additional characteristics

- MPPT charging characteristic: highly efficient, fast, battery-preserving charging
- Microprocessor-controlled charging
- Multi-step charging, adapted to the respective battery type
- Suitable for all common solar modules
- Selection of the battery type by DIP switch
- Low internal current consumption
- Standby function (reduction of the internal current consumption for up to 80 %)
- Individualized configuration via remote control or PC by means of the Webbox possible
- Automatic temperature compensation
- External temperature sensor
- Switchable load output
- Clear LCD display
- Equipped with all important protective functions
- Equalization charging for professional battery maintenance



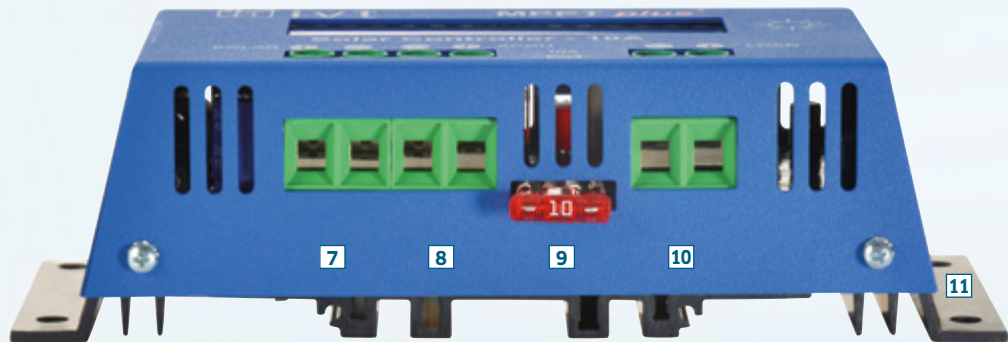
### Maximum Power Point Tracker (MPPT)

The most efficient operating point of the solar module (MPP) changes depending on various factors such as, temperature, radiation power and the type of the solar cells. The technology hidden behind the MPPT regulation continuously determines and uses the maximum power exploitation of the solar modules. At this, the voltage surplus from the solar modules is converted into a higher charging current. This higher charging current assures a shorter battery charging time.





- 1 2 USB sockets for external remote control FB-04 or Webbox-LCD
- 2 DIP switch for selecting the functions
- 3 Manual confirmation of the chosen battery type
- 4 On/off switch for load output
- 5 Socket for external temperature sensor
- 6 Robust metal housing with ventilation slots



- 7 Connection for solar module by screw terminal
- 8 Connection for solar battery
- 9 Exchangeable flat fuse (depending on the model 10 A, 20 A or 30 A)
- 10 Connection load output
- 11 Massive metal rail for fix installation

Recommended application for the high quality MPPT*plus*<sup>+</sup> Solar Controller

MPPT*plus*<sup>+</sup> Solar Controllers are perfectly suitable for solar systems in which the panel voltage is significantly higher than the battery voltage. With the use of an MPPT*plus*<sup>+</sup> Solar Controller 30 % of the solar panel surface can be saved in order to achieve a comparable power exploitation as with common solar chargers.

Specifically in northern latitudes, where despite solar radiation the temperature of the solar module remains low, the MPPT*plus*<sup>+</sup> Solar Controllers make the most out of your solar system's power.

The solar controllers of the MPPT*plus*<sup>+</sup> series are equipped with an intelligent charging technology anlong with many reasonable technical details. The most important are

Automatic recognition of the system voltage

The MPPT*plus*<sup>+</sup> Solar Controllers are suitable for operation within 12 V and 24 V solar systems. They recognize independently whether a 12 V or a 24 V system is connected. The system voltage may be selected manually by means of the DIP switch.

Selectable battery type

The solar controllers are perfectly adapted to charge all types of lead batteries (acid, gel, AGM) and LiFePO<sub>4</sub> batteries. An optimum tuning of the charging characteristics to the different battery types is made possible by the DIP switch.

Automatic temperature compensation

During the charging process the temperature is measured by the external temperature sensor and this allows the dynamic adjustment of the cut-off voltage to the given temperature conditions. At high temperatures the cut-off voltage will be reduced - overcharging and unnecessary gassing is prevented. At low temperatures the cut-off voltage is increased and with this, the batteries are recharged optimally.

Standby function

The standby function can be activated or deactivated, respectively by using the DIP switch. In the case of insufficient solar voltage the solar controller enters the standby mode (if activated). Thus, the internal current consumption of the MPPT*plus*<sup>+</sup> controller is reduced by up to 80 %, the connected battery preserved and unnecessary discharging prevented. As soon as sufficient voltage is applied, the solar controller automatically returns from the standby mode.

Switchable load output

The load output may be manually switched on or off by means of push button.

Multi-step charging technology – Adapted to each battery type

The charging mode is perfectly adapted to the selected battery type. Depending of the battery type charging is done in a two- or in a three-step process, respectively.

System voltage	12 V batteries			24 V batteries		
Battery type	Lead-acid, lead-gel	Lead-AGM	LiFePO <sub>4</sub>	Lead-acid, lead-gel	Lead-AGM	LiFePO <sub>4</sub>
Charging step 1: Cut-off voltage Duration	14.1 V 5 minutes	14.7 V 5 minutes	14.6 V 45 minutes	28.2 V 5 minutes	29.4 V 5 minutes	29.2 V 45 minutes
Charging step 2: Cut-off voltage Duration	13.8 V infinite	13.8 V infinite	14.1 V 90 minutes	27.6 V infinite	27.6 V infinite	28.2 V 90 minutes
Charging step 3: Cut-off voltage Duration	Not available	Not available	13.8 V infinite	Not available	Not available	27.6 V infinite

Individually adjustable charging parameters

The most important parameters of the MPPT*plus*<sup>+</sup> Solar Controllers are individually adjustable. This includes among others cut-off voltage, deep discharge protection, temperature compensation and operation time of the load output. Furthermore the load output can be switched on or off, respectively. These adjustments can only be performed by means of the remote control or via PC by virtue of the Webbox (accessories see page 12-13).

Equalization charging for optimum battery maintenance

For the professional battery maintenance of lead batteries the MPPT*plus*<sup>+</sup> Solar Controller offers the additional function “Equalization charging”. It may be activated via DIP switch. In this mode charging is done with increased cut-off voltage for 60 minutes. Existing sulfate layers inside the battery will be removed and the duty cycle of the battery significantly increased.



Equalization charging

Well-maintained wet or acid batteries, respectively have a significantly longer duty cycle. In the case of longer storage periods without current withdrawal or in the case of deep-discharged batteries we recommend the employment of the function “Equalization charging” in order to remove existing, harmful sulfate layers completely and as early as possible

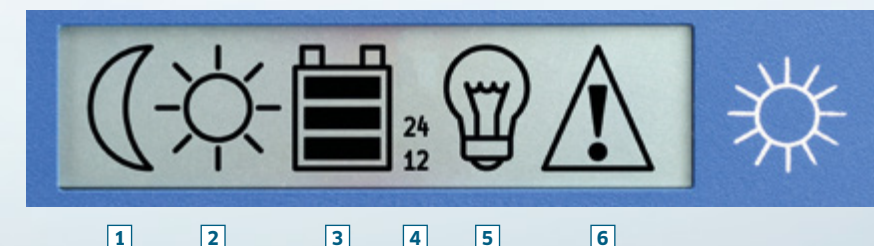
# PROFESSIONAL/ MONITORING & CONTROLLING

## Clear LCD display with graphic symbols

By means of the graphic symbols the easy-to-read and clearly structured LCD display informs the user comprehensively about the current operation status of the system.

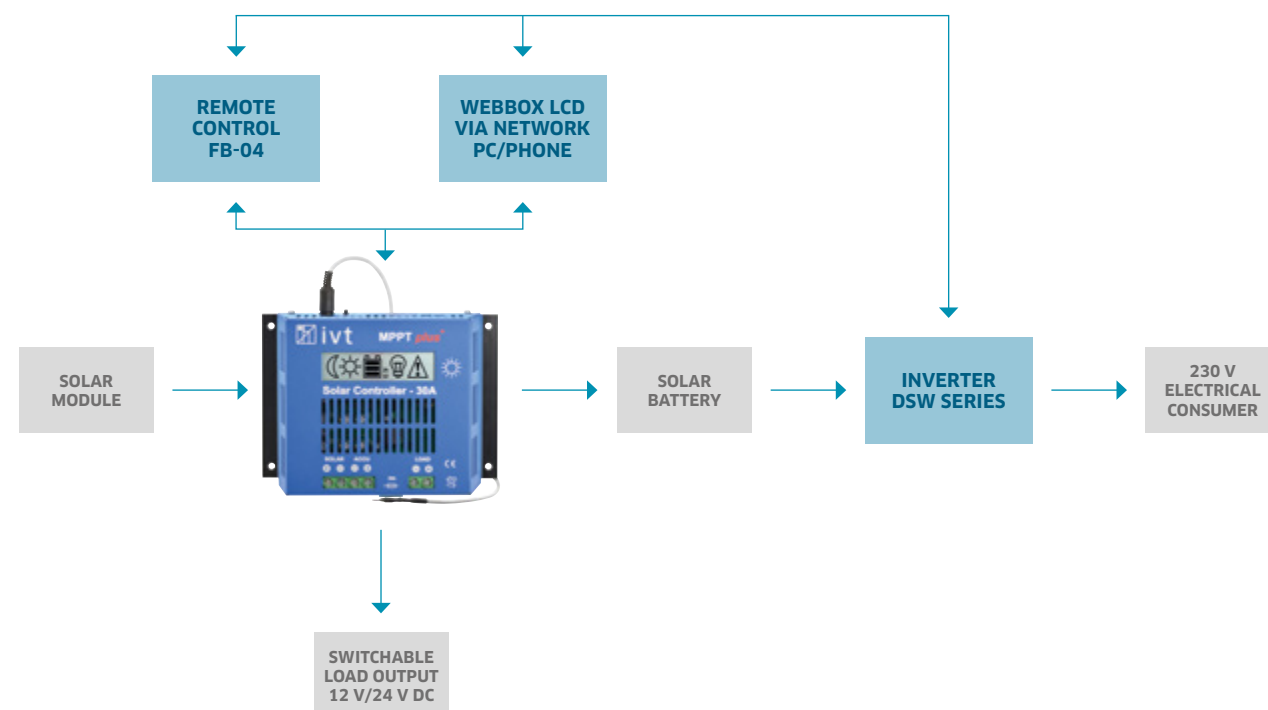
### Symbol explanation

- 1 No solar voltage available/  
device in standby mode
- 2 Sufficient solar voltage
- 3 Battery status indicator
- 4 Used system voltage
- 5 Load output status indicator on/off
- 6 Overvoltage on the battery input



## Monitoring and controlling the power supply professionally

The Solar Controllers of the MPPTplus<sup>+</sup> series are optimally adapted to fit the IVT inverters of the DSW series. With the aid of the original IVT accessories – the Webbox-LCD as well as the Remote Control FB-04 – the permanent surveillance and control of the system's parameters within your autarchic power supply system is made possible. The performance parameters are permanently recorded and available for evaluation.



The accessory components are available on the pages 12-13.

## Extensive protective functions for safe operation

Via microprocessor all relevant protective function such as, overcharging, deep discharge protection and overheating protection are controlled fully automatic.

### Protection against overcharging

As soon as the cut-off voltage is reached, the charging current is shut off by the solar controller. Thus overcharging and damage to the solar battery is prevented.

### Protection against deep discharge with automatic load shut-off and reconnection

The solar controller's deep discharge protection causes an automatic shut-off of the load output in the case the battery voltage drops below the minimum voltage. With this, the deep discharging of the battery is prevented. As soon as the battery is recharged and the battery voltage rises above the reset voltage, the solar controller automatically reconnects the load output.

### Protection against overheating

The MPPTplus<sup>+</sup> Solar Controllers are protected against overheating. A built-in temperature sensor assures that the solar controller shuts off automatically in the case of excessive heating (> 85 °C). As soon as the controller has cooled down it turns back on automatically.

### Protection against short circuit and reverse polarity

The controllers are protected against short circuit as well as against reverse polarity with the aid of a 10 A, 20 A or 30 A flat fuse, depending on the model.



### Non-return valve

All IVT solar controllers are standardly fitted with a non-return valve. In the case of too low solar power for example, at dusk or at night, the non-return valve prevents the discharging of the battery via solar module.

MPPTplus<sup>+</sup> SOLAR CONTROLLER 12 V/24 V

MODEL OVERVIEW & TECHNICAL DATA



MPPT technology

System voltage 12 V/24 V DC

Optionally remote-controlled

Switchable load output 12 V/24 V DC

Suitable batteries: lead-acid, lead-gel, AGM and LiFePO<sub>4</sub>

CE

EU Made in Europe

3 years warranty

Technical data	MPPTplus <sup>+</sup> 10 A	MPPTplus <sup>+</sup> 20 A	MPPTplus <sup>+</sup> 30 A
Battery system voltage	12 V/24 V	12 V/24 V	12 V/24 V
Supported battery types	Lead-acid, lead-gel, lead-AGM, LiFePO <sub>4</sub>	Lead-acid, lead-gel, lead-AGM, LiFePO <sub>4</sub>	Lead-acid, lead-gel, lead-AGM, LiFePO <sub>4</sub>
Type of charge control	MPPT	MPPT	MPPT
Maximum panel power	120 W/240 W	240 W/480 W	360 W/720 W
Maximum panel voltage	70 V	70 V	70 V
Maximum panel/charging current	10 A	20 A	30 A
Maximum load current	10 A	20 A	20 A
Internal current consumption, active	50 mA	50 mA	50 mA
Internal current consumption, standby	< 10 mA	< 10 mA	< 10 mA
Fuse	10 A	20 A	30 A
Reverse polarity protection battery input	Yes	Yes	Yes
Reverse polarity protection solar input	Yes	Yes	Yes
Overheating shut-off	Yes (> 85 °C)	Yes (> 85 °C)	Yes (> 85 °C)
Temperature sensor	Yes (external) 1 m	Yes (external) 1 m	Yes (external) 1 m
Operation temperature range	-20 °C to +60 °C	-20 °C to +60 °C	-20 °C to +60 °C
Maximum efficiency	97 %	97 %	97 %
Common ground potential (negative pole)	Yes	Yes	Yes
Switchable load output	Yes	Yes	Yes
Remote-controllable <sup>1)</sup>	Yes	Yes	Yes
Display	LCD display	LCD display	LCD display
Housing	Metal	Metal	Metal
Dimensions (L x W x H)	190 x 78 x 55 mm	190 x 102 x 55 mm	190 x 142 x 55 mm
Weight	590 g	730 g	950 g
Charging parameters			
Cut-off voltage, lead-acid, lead-gel	14.1 V/28.2 V	14.1 V/28.2 V	14.1 V/28.2 V
Cut-off voltage, lead-AGM	14.7 V/29.4 V	14.7 V/29.4 V	14.7 V/29.4 V
Cut-off voltage, LiFePO <sub>4</sub>	14.6 V/29.2 V	14.6 V/29.2 V	14.6 V/29.2 V
Trickle charging, all battery types	13.8 V/27.6 V	13.8 V/27.6 V	13.8 V/27.6 V
Temperature compensation, minimum <sup>1)</sup>	25 mV/K / 50 mV/K	25 mV/K / 50 mV/K	25 mV/K / 50 mV/K
Temperature compensation, medium <sup>1)</sup>	30 mV/K / 60 mV/K	30 mV/K / 60 mV/K	30 mV/K / 60 mV/K
Temperature compensation, maximum <sup>1)</sup>	35 mV/K / 70 mV/K	35 mV/K / 70 mV/K	35 mV/K / 70 mV/K
Deep discharge protection load output			
Shut-off voltage, factory setting	10.5 V/21 V	10.5 V/21 V	10.5 V/21 V
Shut-off voltage, adjustable range <sup>1)</sup>	10 V to 12 V/20 V to 24 V	10 V to 12 V/20 V to 24 V	10 V to 12 V/20 V to 24 V
Reset voltage	12.5 V/25 V	12.5 V/25 V	12.5 V/25 V
Order no.	200035	200036	200037

- Delivery content
- MPPTplus<sup>+</sup> Solar Controller 10 A, 20 A or 30 A
  - External temperature sensor
  - Operation manual in DE, GB, FR, NL



Personal counselling

Do you need further information?  
Our expert staff gladly provides advice.  
Just ask.

Telephone: +49 9622 719910

E-mail: [info@ivt-hirschau.de](mailto:info@ivt-hirschau.de)

<sup>1)</sup> Only possible with the optional remote controls (FB-04 or Webbox).



# ACCESSORIES/ MPPTplus<sup>+</sup> SOLAR CONTROLLERS & DSW INVERTERS



## Remote Control Touchscreen FB-04 Cable-connected

The Remote Control FB-04 (cable-connected) is compatible with all solar controllers of the MPPTplus<sup>+</sup> series as well as the inverters of the DSW series. Up to 4 devices can be individually controlled and monitored with this remote control. The devices only need to be connected to each other via USB cable. An integrated timer function allows for the automatic on/off switch of your device.

A maximum of 2 independent operation times can be programmed. Operation and surveillance of the most important parameters are achieved by means of the LCD color touchscreen.

### Remote Control: MPPTplus<sup>+</sup> solar controller

Cut-off voltage, deep discharge protection and temperature compensation may be adjusted. Furthermore, you can evaluate and monitor the solar power. The charging current may be limited which is particularly important when charging smaller batteries. It is possible to store operation related data on conventional SD-/SDHC-cards and to export it as a text file (\*.txt).

### Remote Control: DSW inverter

With the remote control you can check the status of the connected battery on the input side and read the output parameters (output voltage, output current, output power) on the output side. Furthermore, it allows for the customized setting of the deep discharge protection value while the load output can be turned on/off.



(Storage card is not included in the delivery content.)

### Delivery content

- Remote Control FB-04
- USB cable

Technical data	FB-04
Operation voltage	10 V
Typ. internal current consumption active	45 mA
Typ. internal current consumption standby	0 mA
Storage battery	CR1220
Anschlusskabel	USB Type A
Speicherkarte	SD/SDHC
Housing	Plastic
Dimensions mm	105 x 65 x 20
Weight	95 g
Order no.	200051



## Webbox-LCD

With the Webbox-LCD MPPTplus<sup>+</sup> solar controllers and the digital sine wave inverters can be monitored and controlled using an existing computer network. For this, the Webbox must simply be connected to the selected network by means of a conventional LAN cable. The device will assign itself an IP address. Via internet browser important operational parameters such as, deep discharge protection, temperature compensation, cut-off voltage or maximum charging current on the input and output side can be controlled and evaluated.

The daily recorded protocol data is stored on the internal memory and can be downloaded as \*.txt file and subsequently imported, for example, into Microsoft Excel for a tabular evaluation. Access via smartphones and tablets is also possible, as long as a connection to the internet is given. The Webbox-LCD will be delivered with a 1.8 m USB cable and matching power supply.

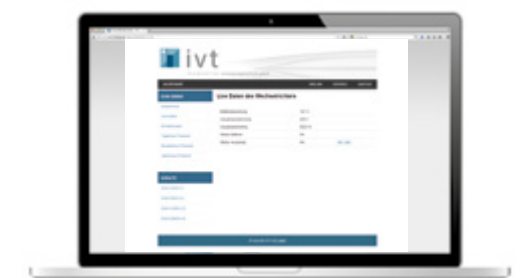


### Delivery content

- Webbox-LCD
- Plug-in power supply
- USB cable

Technical data	Webbox-LCD
Power supply	by USB cable, plug-in power supply
Internal current consumption	50 mA
Interface data exchange	USB Type A
Interface network connection	RJ45
Internal storage battery	CR2032
Dimensions	115 x 80 x 33 mm
Weight	146 g
Order no.	200054

**i Data recording of the Webbox-LCD**  
No additional PC software is required to control the device. The IP address is assigned automatically. The data is recorded on the internal memory.



### Data recording MPPTplus<sup>+</sup> solar controller Remote Control FB-04 and Webbox-LCD

- Date (Date)
- Time (Time)
- Solar power (Ps)
- Solar current (Is)
- Battery voltage (Ub)
- Battery (charging) current (Ib)
- Load current (II)

### Data recording DSW inverter Remote Control FB-04 and Webbox-LCD

- Date (Date)
- Time (Time)
- Output power (Ps)
- Output voltage (Uo)

The parameters will be recorded in intervals of 5 minutes.



# MPPT SOLAR CONTROLLERS

## 12 V/24 V

## 10 A, 20 A, 30 A

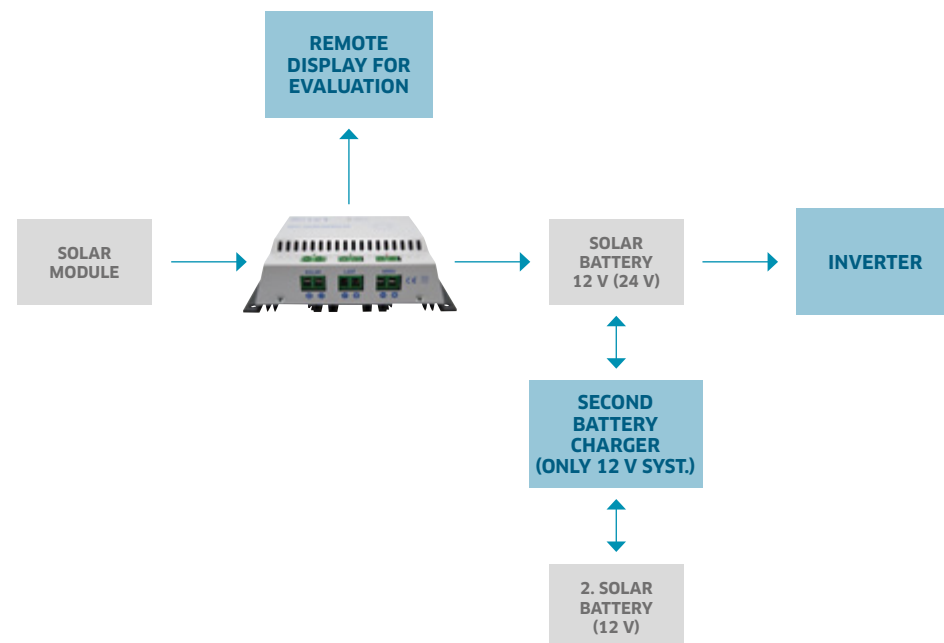
### Efficient charging even under unfavorable light conditions

The MPPT solar controller series contains modern, high quality, microprocessor-controlled devices for the controlled charging of lead batteries within solar stand-alone systems.

#### The MPPT solar controllers by IVT are perfectly suitable

- For solar systems whose panel voltage is significantly higher than the battery voltage
- For solar modules which are partially shaded (for example by trees or satellite receives on the roofs of mobile homes)
- In the case of low or diffuse light (for example, in winter or at low stratus)
- In northern latitudes, where the temperature of the solar module remains low despite the sun radiation

The MPPT function (Maximum Power Point Tracker) assures the use of the maximum solar power at all times.



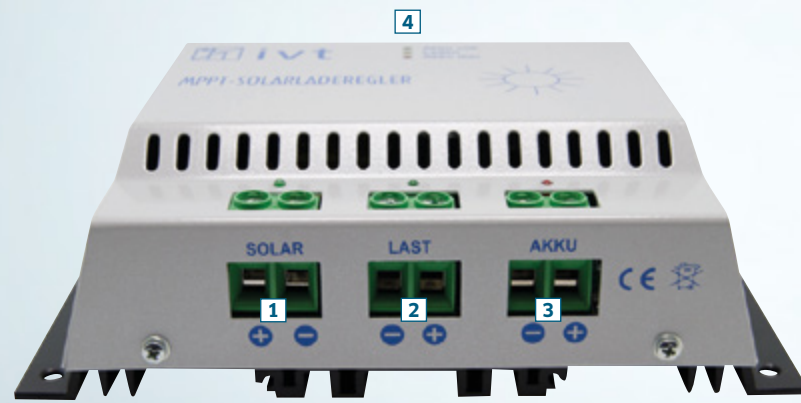
### The most important characteristics and features

- MPPT charging mode
- Automatic voltage recognition 12 V/24 V
- Standby function with internal current consumption of only < 1 mA
- Step-up function

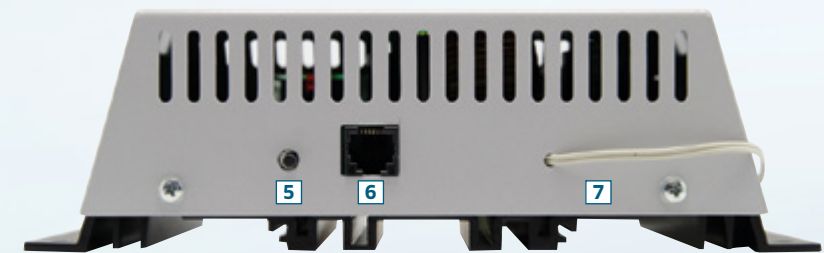
### Additional characteristics

- Microprocessor-controlled charging
- Multi-step charging mode
- Suitable for lead batteries (acid, gel)
- Automatic temperature compensation
- External temperature sensor
- Load output switchable by push button
- Optical operation indicator (LEDs)
- Protection against reverse polarity, overvoltage, overload, overcharging, deep discharge, overheating
- With short circuit protection and non-return valve
- Robust metal housing
- Monitoring of the battery and evaluation of the solar parameters possible via remote display





- 1 Connection terminal solar module
- 2 Connection terminal load output for 12 V/24 V consumers
- 3 Connection terminal solar battery
- 4 Status indicator solar battery



- 5 Push button for load output
- 6 RJ/12 connection terminal for remote display
- 7 External temperature sensor

## Good equipment included

### Automatic recognition of the system voltage

This IVT solar controller is suitable for operation in 12 V and 24 V solar systems. It recognizes independently whether it is connected to a 12 V or to a 24 V system.

### Optical operation indicator

The MPPT controller is equipped with several LEDs and informs the user extensively about the current operation status of the system. The various LEDs provide information about solar input side (solar voltage is applied), the battery status (charging/discharging/battery full/battery low) and about the state of the load output (on/off).

### Standby function

In the case of insufficient solar power the solar controller will enter the standby mode. This reduces the internal current consumption by over 90 %. The connected battery is preserved and an unnecessary discharging prevented. As soon as sufficient solar power is available the solar controller automatically returns from the standby mode. Furthermore the MPPT can be brought into active mode manually by using the push button on the device itself or by using the remote display which is available as an optional accessory.

### Extensive protective functions

All important protective functions such as, overcharging and deep discharge protection are controlled fully automatic and failure-free by the microprocessor. As soon as the cut-off voltage is reached the solar controller disconnects the charging current. Overcharging and damage to the solar battery is prevented.

The deep discharge protection with the automatic load switch-off or switch-on, respectively assures that the solar controller disconnects the load output as soon as the battery voltage drops below the minimum allowed value. If the battery is recharged and the battery voltage rises above the reset voltage, the solar controller reconnects the load output automatically.

With the aid of a flat fuse the controllers are secured against short circuit as well as against reverse polarity. In the case a battery is connected with reverse polarity the corresponding LED on the input side lights up.

## Multi-step charging technology – Perfect for lead batteries

The charging characteristic is perfectly attuned to lead batteries. A multi-step charging process is applied.

### 1. Main charging phase

The battery is charged up to a voltage of 14.1 V (28.2 V) with maximum current.

### 2. Timer phase

The battery is kept at a voltage of 14.1 V (28.2 V) for several minutes. The duration of the timer phase is determined by the type, age and the quality of the battery.

### 3. Charge preservation phase

In this phase the solar controller emits pulses into the battery which in consequence removes the existing sulfate layers (desulfation function). At this, the battery voltage is kept at 13.7 V (27.4 V).

### 4. Standby phase

In this phase no charging current flows. The battery voltage slowly decreases.

### Automatic temperature compensation

During the charging process the prevalent temperature is measured by means of the external temperature sensor. This allows for dynamic adjustment of the cut-off voltage to the temperature conditions. At high temperatures the cut-off voltage will be decreased – overcharging and unnecessary gassing are prevented. At lower temperatures the cut-off voltage will be increased, the batteries can be recharged in an optimum manner.

### Step-up function

The MPPT solar controllers are equipped with a step-up function. Advantage: the solar controller charges even if the solar voltage is lower than the battery voltage. At this, the maximum charging current is 1 A.

### Switchable load output

The load output is manually switchable via push button. It makes it possible to switch all electrical consumers connected to the solar controller on or off with a single push of the button.

# MPPT SOLAR CONTROLLER 12 V/24 V

## MODEL OVERVIEW & TECHNICAL DATA



MPPT technology

System voltage 12 V/24 V DC

Suitable batteries: lead-acid, lead-gel

Switchable load output 12 V/24 V DC

Step-up-function

Optional remote display

CE

EU Made in Europe

3 years warranty

Technical data	MPPT 10 A	MPPT 20 A	MPPT 30 A
Battery system voltage	12 V/24 V	12 V/24 V	12 V/24 V
Supported battery types	Lead-acid, lead-gel	Lead-acid, lead-gel	Lead-acid, lead-gel
Possibility to connect a 2. battery	No	No	No
Regulation mode	MPPT	MPPT	MPPT
Maximum panel power	120 W/240 W	240 W/480 W	360 W/720 W
Maximum panel voltage	60 V	60 V	60 V
Maximum panel-/charging current	10 A	20 A	30 A
Maximum load current	10 A	20 A	30 A
Internal current consumption, active	15 mA (130 mA load output active)	15 mA (130 mA load output active)	15 mA (130 mA load output active)
Internal current consumption, standby	< 1 mA	< 1 mA	< 1 mA
Fuse	10 A	20 A	30 A
Reverse polarity protection battery input	Yes (indication via LED)	Yes (indication via LED)	Yes (indication via LED)
Reverse polarity protection solar input	Yes	Yes	Yes
Overheating shut-off	Yes	Yes	Yes
Temperature sensor	Yes (external)	Yes (external)	Yes (external)
Step-up function	Yes	Yes	Yes
Impulse charging for desulfation	Yes	Yes	Yes
Temperature range	-25 °C to +60 °C	-25 °C to +60 °C	-25 °C to +60 °C
Common ground potential (negative pole)	Yes	Yes	Yes
Switchable load output	Yes	Yes	Yes
Remote display	Yes	Yes	Yes
Display	LED	LED	LED
Housing	Metal	Metal	Metal
Dimensions (L x W x H)	190 x 112 x 59 mm	190 x 112 x 59 mm	190 x 112 x 59 mm
Weight	780 g	870 g	890 g
Charging parameters			
Cut-off voltage	14.1 V/28.2 V	14.1 V/28.2 V	14.1 V/28.2 V
Trickle charging	13.7 V/27.4 V	13.7 V/27.4 V	13.7 V/27.4 V
Temperature compensation	24 mV/K / 48 mV/K	24 mV/K / 48 mV/K	24 mV/K / 48 mV/K
Deep discharge protection load output Lastausgang			
Shut-off voltage	10.5 V/21 V	10.5 V/21 V	10.5 V/21 V
Reset voltage	12.5 V/25 V	12.5 V/25 V	12.5 V/25 V
Order no.	200026	200027	200028

- Delivery content**
- MPPT Solar Controller
  - External temperature sensor
  - Operation manual in DE, GB, FR, NL

i

**Accessory**  
Remote Display for MPPT solar controller



By virtue of the Remote Display for MPPT solar controllers monitoring the real time operation data during the ongoing runtime becomes possible. Furthermore, it allows for the storage of the operation parameters with date and time in \*.txt format on a SD-card<sup>1</sup> for later evaluation on the PC.

**Data recording (in 10 second intervals)**

- Date (DATE)
- Time (TIME)
- Battery voltage (U1)
- Battery current (I1)
- Solar voltage (Us)
- Solar current (Is)

**For the 3 A version both batteries may be evaluated separately.**

**Order no. 200029**

<sup>1</sup>Not included in the delivery content.



# SCplus-/SCDplus SOLAR CONTROLLER-SERIES

## 12 V/24 V/48 V

## 15 A, 25 A, 40 A

### High quality Solar Controller Series with numerous adjustment possibilities

The high quality *SCplus/SCDplus* Solar Controllers by IVT are characterized above all by their versatility. They offer 4 predefined charging characteristics, which are optimally attuned to all common battery types. In addition, their load output is equipped with various special functions which allow for individual adjustment. Furthermore, when using the free software certain charging parameters may be programmed and the data evaluated.

#### The most important characteristics and features

- Serial solar controllers: extremely precise, battery-preserving charging
- Pulse-width-modulated charging mode (PWM)
- Predefined charging characteristics: lead-acid, lead-gel, lead-AGM, LiFePO<sub>4</sub>
- Switchable load output (on/off)
- Timer function
- Night light function
- Standby function: internal current consumption < 10 mA

#### Further characteristics

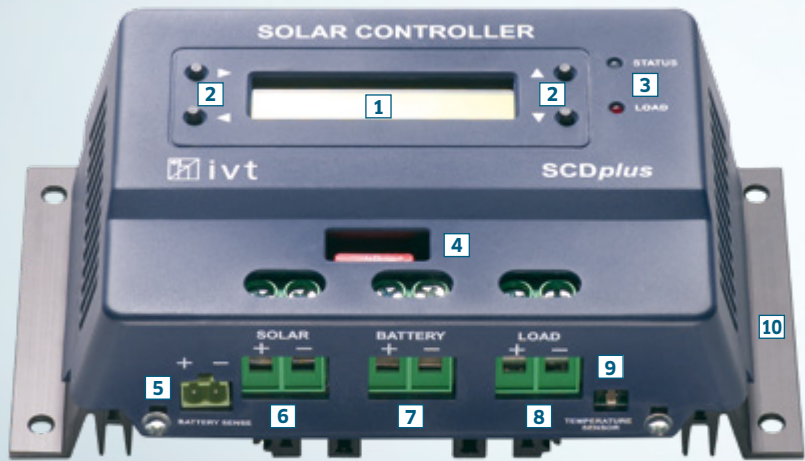
- Microprocessor-controlled charging
- Multi-step charging process
- User-specific programmable charging characteristic
- Automatic voltage recognition 12 V/24 V
- High efficiency grade max. 98 %
- Low internal current consumption
- Automatic temperature compensation
- External temperature sensor
- Higher precision due to an additional external voltage sensor
- Adjustable temperature coefficient
- LED status indicator
- Optical warning signal
- Equipped with all important protective functions
- Common ground potential (negative pole)
- Separate 48 V *SCDplus* version



**SCplus Solar Controller**  
without LCD display and  
without control buttons

**SCDplus Solar Controller**  
with LCD display and  
with control buttons





- 1

LCD display (only SCDplus)
- 2

Operation buttons (only SCDplus)
- 3

LED status indicators
- 4

Flat fuse
- 5

Connection terminal voltage sensor
- 6

Connection terminal solar module
- 7

Connection terminal solar battery
- 8

Connection terminal load output
- 9

Connection terminal external temperature sensor
- 10

Metal rails for secure mounting



- 11

On/off switch load output
- 12

USB interface (Typ B) for connection to PC

Individual charging – extremely efficient and reliable

For the pulse-width-modulated serial controllers 4 different charging programs are predefined, specifically attuned to the respective battery type: lead-acid, lead-gel, lead-AGM as well as LiFePO<sub>4</sub>. In addition, a user-specific charging program may be selected.

With the aid of the USB interface a connection between solar controller and PC may be established. Using the windows software on your PC it is comfortably possible to modify the factory settings. Furthermore, your solar system’s operation data may be recorded, stored and evaluated.

Automatic voltage recognition 12 V/24 V

The solar controllers can be operated in 12 V or 24 V systems. At this, the system voltage is determined automatically.

48 V version

An additional SCDplus solar controller with 40 A is available for 48 V systems.

Automatic temperature compensation

During the charging process the prevalent temperature is measured by means of the external temperature sensor. This allows for the dynamic adjustment of the cut-off voltage to the temperature conditions. At high temperatures the cut-off voltage will be decreased – overcharging and unnecessary gassing are prevented. At lower temperatures the cut-off voltage will be increased.

Voltage sensor for the battery

An even more precise function of the solar controller is made possible by using the integrated voltage sensor terminal. Via cable between solar controller and battery an even more exact measurement of the battery voltage is achieved. This allows for a more precise charging.

Multi-step charging technology – Attuned to the defined battery type

Depending on the defined battery type (factory setting: lead-acid battery) and its cut-off voltage the charging is done in 3 steps.

In step 1 the battery is charged with maximum current until the cut-off voltage is reached. Thereafter, the cut-off voltage reached in step 1 is kept for a precisely defined period of time. Subsequently it changes to step 2, trickle charging.

The charging current limitation is applied according to the principal of the pulse-width modulation (PWM) (see graphic on page 47).

Both, the charging profile for LiFePO<sub>4</sub> batteries as well as the user-defined profile offer a third charging step.

System voltage	12 V   24 V   48 V (SCDplus 48 V/40 A only)				
Battery type	Lead-acid battery	Lead-gel battery	Lead-AGM battery	LiFePO <sub>4</sub> battery	User defined
Charging step 1: Charging end voltage Duration	14.0 V   28.0 V   56.0 V 60 minutes	14.1 V   28.2 V   56.4 V 90 minutes	14.7 V   29.4 V   58.8 V 60 minutes	14.2 V   28.4 V   56.8 V 60 minutes	User defined User defined
Charging step 2: Charging end voltage Duration	13.7 V   27.4 V   54.8 V infinite	13.7 V   27.4 V   54.8 V infinite	13.8 V   27.6 V   55.2 V infinite	13.8 V   27.6 V   55.2 V infinite	User defined User defined
Charging step 3: Charging end voltage Duration	not available	not available	not availabler	not available	User defined User defined

LED status indicator

2 LEDs indicate quickly and reliably the ongoing charging step, warn of deep discharging and show the state of the load output.

Standby function

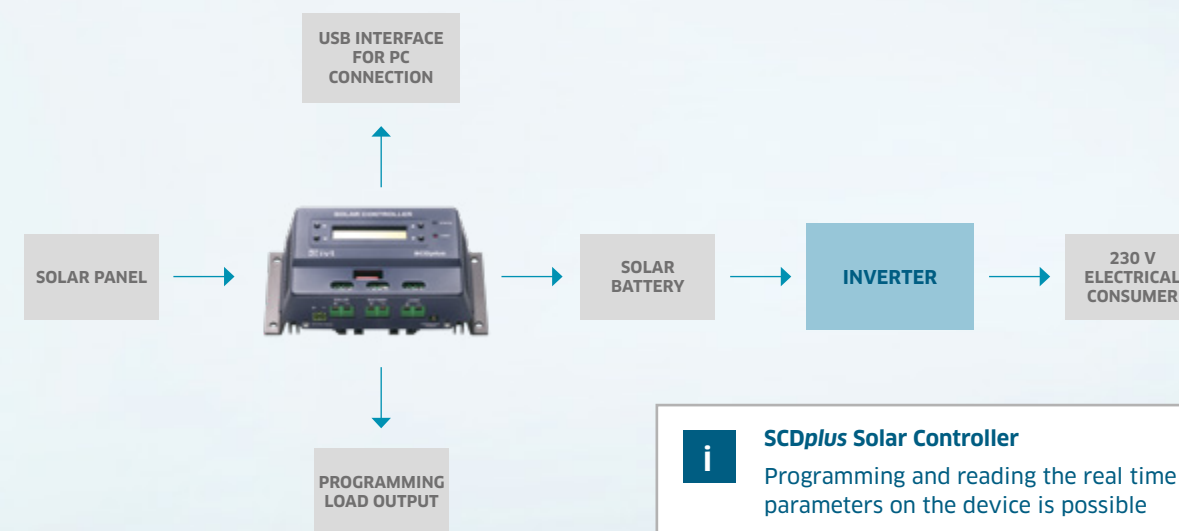
The SCplus-/SCDplus Solar Controllers offer an integrated standby function. In the case of insufficient solar power the solar controller switches into standby mode. This way, the internal current consumption of the solar controller is reduced by up to 40 %.

With this, the connected battery is preserved and unnecessary discharging prevented. If sufficient solar power is available the solar controller returns to active mode automatically. Furthermore, the solar controller can be switched into active mode manually via push button.



# VERSATILE/ PROGRAMMABLE LOAD OUTPUT

Many individual adjustments can be performed on the IVT solar controllers of the *SCplus/SCDplus* series. A special feature is the programmable load output, among others with night light and timer function.



## Programmable load output

The load output is individually programmable. The following options can be selected for the load output:

- 1. Timer function**  
The load output shuts on or off at the defined time.
- 2. Night light function**  
If no solar power is available the load output shuts on after 2 minutes, and shuts off again if solar power is available.
- 3. Automatic on/off switch**  
In the case the end-point voltage is reached the load output shuts off automatically. As soon as the reactivation voltage is reached it turns back on.
- 4. Permanently off**  
If the end-point voltage is reached the load output remains off permanently, even after the battery capacity has reached the reactivation voltage (factory setting).

## Extensive protective functions included

All important protective functions such as overcharging, deep discharge protection and reverse polarity protection are controlled fully automatic and surveillance-free by the microprocessor.

### Protection against overcharging

As soon as the cut-off voltage is reached the solar controller disconnects the charging current. With this, overcharging and damaging the battery is prevented.

### Deep discharge protection

In order to protect the battery against unrepairable damage in the case of deep discharging, the load output will be shut off if the end-point voltage is reached.

Depending on the chosen setting, the load output remains off or will be switched on automatically, respectively if the battery has been recharged sufficiently. End-point voltage and reactivation voltage can be set individually via display or via software. An optical warning (LED) is given shortly before the end-point threshold is reached.

### Protection against short circuit and reverse polarity

The controllers are secured against short circuit and reverse polarity by means of a flat fuse.

## SCDplus Solar Controller with illuminated LCD display and comfortable control buttons

### SCDplus: Clear display - simple operation

The *SCDplus* controllers are additionally equipped with a clearly structured LCD display. It informs about the most important parameters such as system voltage (12 V, 24 V or 48 V), solar input (energy counter), battery status (battery voltage, charging condition, charging current), ambient temperature, selected temperature coefficient and load output (load current).

### The following parameters can be configured via display

- Charging characteristic
- End-point voltage
- Reactivation voltage
- Temperature coefficient
- Load output (reactivation yes/no, timer and night light function)



### Parameter setting and monitoring of the solar controller via PC

A connection between the solar controller and PC may be established by virtue of the USB interface. It is possible to configure charging profile, deep discharge protection, temperature coefficient, load output functions, time and date on the PC by using the windows software. Furthermore, the operation data of the solar system can be protocolled, monitored, exported in \*.txt format for evaluation.

### Data recording and evaluation with the free software

The following parameters are recorded every second: time (Time), battery voltage (Voltage), battery charging current (Charge current), load current (Load current) and temperature (Temperature). For detailed information regarding the software please refer to the operation manual of the *SCplus/SCDplus* series.

### Software download

The free software may be downloaded from our website [www.ivt-hirschau.com](http://www.ivt-hirschau.com). It is available in the download area as well as directly in the product view.

# SCplus-/SCDplus-SOLAR CONTROLLER 12 V/24 V (48 V) MODEL OVERVIEW & TECHNICAL DATA

Serial charging regulation

System voltage 12 V/24 V DC (48 V)

Suitable batteries: lead-acid, lead-gel, AGM and LiFePO<sub>4</sub>

Timer function

Nightlight function

PC interface

CE

EU Made in Europe

3 years warranty



- Delivery content**
- SCplus/SCDplus Solar Controller
  - External temperature sensor
  - Adaptor for battery sensor
  - Operation manual in DE, GB, FR, NL

Technical data	SCplus 15 A	SCplus 25 A	SCplus 40 A	SCDplus 15 A	SCDplus 25 A	SCDplus 40 A	SCDplus 48 V/40 A
Battery system voltage	12 V/24 V	12 V/24 V	12 V/24 V	12 V/24 V	12 V/24 V	12 V/24 V	48 V
Supported battery types	Lead-acid, lead-gel, lead-AGM, LiFePO <sub>4</sub>	Lead-acid, lead-gel, lead-AGM, LiFePO <sub>4</sub>	Lead-acid, lead-gel, lead-AGM, LiFePO <sub>4</sub>	Lead-acid, lead-gel, lead-AGM, LiFePO <sub>4</sub>	Lead-acid, lead-gel, lead-AGM, LiFePO <sub>4</sub>	Lead-acid, lead-gel, lead-AGM, LiFePO <sub>4</sub>	Lead-acid, lead-gel, lead-AGM, LiFePO <sub>4</sub>
Type of charge control	PWM serial	PWM serial	PWM serial	PWM serial	PWM serial	PWM serial	PWM serial
Maximum panel power	180 W/360 W	300 W/600 W	480 W/960 W	180 W/360 W	300 W/600 W	480 W/960 W	1920 W
Maximum panel voltage	50 V	50 V	50 V	50 V	50 V	50 V	90 V
Maximum panel/charging current	15 A	25 A	40 A	15 A	25 A	40 A	40 A
Maximum load current	15 A	25 A	40 A	15 A	25 A	40 A	40 A
Internal current consumption, active	25 mA	25 mA	25 mA	50 mA	50 mA	50 mA	50 mA
Internal current consumption, standby	< 10 mA	< 10 mA	< 10 mA	< 10 mA	< 10 mA	< 10 mA	< 10 mA
Fuse	15 A	25 A	40 A	15 A	25 A	40 A	40 A
Reverse polarity protection, battery input	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reverse polarity protection, solar input	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Overcurrent protection, load output	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Temperature sensor	Yes (external), 1.5 m	Yes (external), 1.5 m	Yes (external), 1.5 m	Yes (external), 1.5 m	Yes (external), 1.5 m	Yes (external), 1.5 m	Yes (external), 1.5 m
Operation temperature	-20 °C to +60 °C	-20 °C to +60 °C	-20 °C to +60 °C	-20 °C to +60 °C	-20 °C to +60 °C	-20 °C to +60 °C	-20 °C to +60 °C
Maximum efficiency	98 %	98 %	98 %	98 %	98 %	98 %	98 %
Common ground potential (negative pole)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Switchable load output	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Software control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PC interface	USB (type B)	USB (type B)	USB (type B)	USB (type B)	USB (type B)	USB (type B)	USB (type B)
Display	LED	LED	LED	LCD display + LED	LCD display + LED	LCD display + LED	LCD display + LED
Housing	Plastic	Plastic	Plastic	Plastic	Plastic	Plastic	Plastic
Dimensions (L x W x H)	190 x 105 x 55 mm	190 x 105 x 55 mm	190 x 105 x 55 mm	190 x 105 x 55 mm	190 x 105 x 55 mm	190 x 105 x 55 mm	190 x 105 x 55 mm
Weight	460 g	460 g	480 g	520 g	520 g	540 g	540 g
Charging parameters							
Cut-off voltage, lead-acid	14 V/28 V	14 V/28 V	14 V/28 V	14 V/28.0 V	14 V/28 V	14 V/28 V	56 V
Cut-off voltage, lead-gel	14.1 V/28.2 V	14.1 V/28.2 V	14.1 V/28.2 V	14.1 V/28.2 V	14.1 V/28.2 V	14.1 V/28.2 V	56.4 V
Cut-off voltage, lead-AGM	14.7 V/29.4 V	14.7 V/29.4 V	14.7 V/29.4 V	14.7 V/29.4 V	14.7 V/29.4 V	14.7 V/29.4 V	58.8 V
Cut-off voltage, LiFePO <sub>4</sub>	14.6 V/29.2 V	14.6 V/29.2 V	14.6 V/29.2 V	14.6 V/29.2 V	14.6 V/29.2 V	14.6 V/29.2 V	58.4 V
Trickle charging, lead-acid/lead-gel	13.7 V/27.4 V	13.7 V/27.4 V	13.7 V/27.4 V	13.7 V/27.4 V	13.7 V/27.4 V	13.7 V/27.4 V	54.8 V
Trickle charging, lead-AGM/LiFePO <sub>4</sub>	13.8 V/27.6 V	13.8 V/27.6 V	13.8 V/27.6 V	13.8 V/27.6 V	13.8 V/27.6 V	13.8 V/27.6 V	55.2 V
Temperature compensation, minimum	25 mV/K / 50 mV/K	25 mV/K / 50 mV/K	25 mV/K / 50 mV/K	25 mV/K / 50 mV/K	25 mV/K / 50 mV/K	25 mV/K / 50 mV/K	100 mV/K
Temperature compensation, medium	30 mV/K / 60 mV/K	30 mV/K / 60 mV/K	30 mV/K / 60 mV/K	30 mV/K / 60 mV/K	30 mV/K / 60 mV/K	30 mV/K / 60 mV/K	120 mV/K
Temperature compensation, maximum	35 mV/K / 70 mV/K	35 mV/K / 70 mV/K	35 mV/K / 70 mV/K	35 mV/K / 70 mV/K	35 mV/K / 70 mV/K	35 mV/K / 70 mV/K	140 mV/K
Deep discharge protection, load output							
Shut-off voltage, factory setting	10.5 V/21 V	10.5 V/21 V	10.5 V/21 V	10.5 V/21 V	10.5 V/21 V	10.5 V/21 V	42 V
Shut-off voltage, adjustable range	10 V to 11 V/20 V to 22 V	10 V to 11 V/20 V to 22 V	10 V to 11 V/20 V to 22 V	10 V to 11 V/20 V to 22 V	10 V to 11 V/20 V to 22 V	10 V to 11 V/20 V to 22 V	40 V to 44 V
Reset voltage, factory setting	12 V/24 V	12 V/24 V	12 V/24 V	12 V/24 V	12 V/24 V	12 V/24 V	48 V
Reset voltage, adjustable range	11.5 V to 12.5 V/23 V to 25 V	11.5 V to 12.5 V/23 V to 25 V	11.5 V to 12.5 V/23 V to 25 V	11.5 V to 12.5 V/23 V to 25 V	11.5 V to 12.5 V/23 V to 25 V	11.5 V to 12.5 V/23 V to 25 V	46 V to 50 V
Order no.	200038	200039	200040	200041	200042	200043	200044



# SERIAL SOLAR CONTROLLERS/ SMALL, COST-EFFECTIVE, RELIABLE



Serial charging regulation

System voltage 12 V/24 V DC

Load output 12 V/24 V

Geeignete Akkus: Blei-Säure, Blei-Gel

CE

EU Made in Europe

3 years warranty



Serial charging regulation

System voltage 12 V/24 V DC

Geeignete Akkus: Blei-Säure, Blei-Gel

CE

EU Made in Europe

3 years warranty

## Solar Controller 12 V/24 V, 4 A with deep discharge protection

The IVT Solar Controller 12 V/24 V, 4 A with deep discharge protection is a small, reliable solar controller for smaller solar systems up to 4 A. The solar controller can be used for 12 V as well as for 24 V battery systems. At this, the switching of the system voltage is performed by a plug-in jumper. The charging of the solar battery is done according to the PWM charging method. The controller is suitable for lead-acid and lead-gel batteries. 12 V/24 V direct current electrical consumers can be connected directly to the solar controller.

The integrated deep discharge protection assures the automatic disconnection of the load output if the battery voltage drops below the minimum voltage. As soon as the battery is recharged and the battery voltage is above the reactivation voltage the solar controller automatically reconnects the load output. If the cut-off voltage is reached the charging current will be turned off, whereby the connected battery is protected against overcharging.

With its internal current consumption of only 3 mA this solar controller is extremely economic. It is equipped with 2 LEDs which inform you about the real time battery status (battery full/battery charging).

### Features

- **Serial charge controller**
- **Suitable for 12 V- and 24 V solar systems**
- **Suitable for lead-acid and lead-gel batteries**
- **PWM charging method**
- **Gentle battery charging**
- **Low internal current consumption 3 mA**
- **With deep discharge and overcharging protection**
- **With non-return valve**
- **12 V/24 V DC load output**
- **LED battery status indicator**

### Delivery content

- Solar Controller 12 V/24 V, 4 A, with deep discharge protection
- Operation manual in DE, GB, FR, NL



#### PWM charging method

Solar controllers which operate based on the PWM principle charge the battery with maximum current at the beginning of the charging process. As soon as the respective cut-off voltage is reached the current flow is stopped, so that overcharging is prevented.

Most of the times the battery is not fully charged after this first charging step. A drop of the battery voltage is to be expected. Therefore the charging current is initiated again if the voltage falls short of a defined value. This process will be repeated until the battery is fully charged.

## Solar Controller 12 V, 4 A

The IVT Solar Controller 12 V, 4 A is an uncomplicated and extremely reliable device for charging lead-acid and lead-gel batteries within smaller solar systems. It charges the battery according to the PWM charging method. 2 LEDs indicate if the battery is full or if is still being charged.

The charge controller is protected against overcharging and is standardly equipped with a non-return valve.

Technical data	4 A	4 A
Battery system voltage	12 V/24 V	12 V
Supported battery types	Lead-acid, lead-gel	Lead-acid, lead-gel
Type of charge control	PWM serial	PWM serial
Maximum panel power	55 W/110 W	55 W
Maximum panel voltage	22 V/35 V	22 V
Maximum panel/charging current	4 A	4 A
Load current	4 A	-
Internal current consumption	3 mA	2.5 mA
Operation temperature range	-25 °C to +50 °C	-10 °C to +50 °C
Display	LED	LED
Housing	Plastic	Plastic
Dimensions (L x W x H)	66 x 60 x 25 mm	66 x 60 x 25 mm
Weight	40 g	40 g
Charging parameters		
Cut-off voltage, lead-acid/lead-gel	13.8 V/27.6 V	13.8 V
Trickle charging, lead-acid/lead-gel	13.8 V/27.6 V	13.8 V
Deep discharge protection load output		
Shut-off voltage	10.5 V/21 V	-
Reset voltage	12 V/24 V	-
Art.-Nr.	200013	200007

### Features

- **Serial charge controller**
- **Suitable for 12 V solar systems**
- **PWM charging method**
- **Suitable for lead-acid and lead-gel batteries**
- **Low internal current consumption 2.5 mA**
- **With overcharging protection**
- **With non-return valve**
- **LED battery status indicator**

### Delivery content

- Solar Controller 12 V, 4 A
- Operation manual in DE, GB, FR, NL

# SHUNT CHARGE CONTROLLER/ GENTLE & RELIABLE CHARGING

PWM Shunt charging regulation

System voltage 12 V/24 V DC

Suitable batteries: lead-acid, lead-gel

Load output 12 V/24 V

CE

Made in Europe

3 years warranty



## Shunt Solar Controller 12 V/24 V, 8 A and 20 A

The cost-effective 8 A and 20 A shunt solar controllers are ideal for small and medium size solar systems. They recognize independently whether a 12 V or a 24 V system is connected. The shunt charge controllers are equipped with the essential regulating and protective functions which are required for gentle and safe charging and discharging of lead-acid and lead-gel batteries:

- PWM charging method (see page 47)
- Overcharging protection
- Gassing regulation
- Deep discharge protection

### Deep discharge protection

The integrated deep discharge protection automatically turns the load output off as soon as the battery voltage drops below the minimum voltage. If the battery has been recharged and the battery voltage rises above the reactivation voltage the solar controller turns the load output on automatically. Overcharging is prevented by virtue of the integrated overcharging protection.

### Automatic temperature compensation

The temperature sensor (built-in for the 8 A, external for the 20 A) allows for the best possible charging of the battery in the case of fluctuating temperatures. The cut-off voltage and the gassing-end voltage are adapted dynamically to the prevalent temperatures. In the case of high temperatures the cut-off voltage will be decreased, at low temperatures it will be increased.

### Gassing regulation

If a lead battery is operated for a longer period of time without a controlled gas development harmful acidic layers may be built. The solar controller eliminates or prevents, respectively the forming of acidic layers by means of controlled gassing. This behavior also depends on the temperature and is compensated by the integrated or external temperature sensor, respectively.

### LED indicator

The two LEDs inform about the real time charging condition as well as about the operation status of the battery.

## Features

- Shunt charging regulation
- Pulse-width-modulated charging control (PWM)
- Suitable for lead-acid and lead-gel batteries
- Automatic voltage recognition 12 V/24 V
- Controlled, temperature-dependent gassing
- 8 A version with integrated temperature sensor
- 20 A version with external temperature sensor
- Temperature-compensated charging
- Low internal current consumption
- LED battery status indicator
- Robust metal housing
- Equipped with all important protective functions

### Delivery content Solar Controller 12 V/24 V, 8 A

- Solar controller
- Operation manual in DE, GB, FR, NL

### Delivery content Solar Controller 12 V/24 V, 20 A

- Solar controller
- External temperature sensor
- Operation manual in DE, GB, FR, NL

Technical data	Solar Controller 12 V/24 V, 8 A	Solar Controller 12 V/24 V, 20 A
Battery system voltage	12 V/24 V	12 V/24 V
Supported battery types	Lead-acid, lead-gel	Lead-acid, lead-gel
Type of charge control	PWM Shunt	PWM Shunt
Maximum panel power	90 W/180 W	240 W/480 W
Maximum panel voltage	22 V/35 V	22 V/35 V
Maximum panel/charging current	8 A	20 A
Maximum load current	8 A	20 A
Internal current consumption	2 mA	4 mA
Fuse	10 A	20 A
Temperature sensor	Yes, integrated	Yes, external
Operation temperature	-25 °C to +50 °C	-25 °C to +50 °C
Common ground potential (negative pole)	No	No
Switchable load output	No	No
Display	LED	LED
Housing	Metal	Metal
Dimensions (L x W x H)	95 x 95 x 35 mm	190 x 100 x 85 mm
Weight	230 g	300 g
Charging parameters		
Cut-off voltage	13.7 V/27.4 V	13.7 V/27.4 V
Cut-off voltage, gassing deactivated	14.1 V/28.2 V	14.1 V/28.2 V
Trickle charging	13.7 V/27.4 V	13.7 V/27.4 V
Trickle charging, gassing deactivated	14.1 V/28.2 V	14.1 V/28.2 V
Gassing active from	12.4 V/24.8 V	12.4 V/24.8 V
Gassing-end voltage	14.5 V/29 V	14.5 V/29 V
Temperature compensation	24 mV/K / 48 mV/K	24 mV/K / 48 mV/K
Temperature compensation, at gassing	18 mV/K / 36 mV/K	18 mV/K / 36 mV/K
Deep discharge protection load output		
Shut-off voltage	11.1 V/22.2 V	11.1 V/22.2 V
Reset voltage	12.6 V/25.2 V	12.6 V/25.2 V
Order no.	200001	200002



# SHUNT SOLAR CONTROLLER / SIMPLE, LIGHT IN WEIGHT, RELIABLE

PWM Shunt charging regulation

System voltage 12 V/24 V DC

Suitable batteries: lead-acid, lead-gel

Load output 12 V/24 V

CE

Made in Europe

3 years warranty



## Shunt Solar Controller 12 V/24 V, 6 A and 8 A

The cost-effective 6 A and 8 A shunt solar controller are ideal for small and medium size solar systems. They recognized self-employed whether a 12 V or a 24 V system is connected. The shunt charge controllers are equipped with the essential regulating and protective functions which are required for gentle and safe charging and discharging of lead-acid and lead-gel batteries:

- PWM charging method (see page 47)
- Overcharging protection
- Gassing regulation
- Deep discharge protection

### Deep discharge protection

The integrated deep discharge protection automatically turns the load output off, as soon as the battery voltage drops below the minimum voltage. If the battery has been recharged and the battery voltage rises above the reactivation voltage the solar controller reactivates the load output automatically. Overcharging is prevented by virtue of the integrated overcharging protection.

### Automatic temperature compensation

The temperature sensor assures the best possible charging of the battery even in the case of fluctuating temperatures. The cut-off voltage and the gassing-end voltage are adapted dynamically to the prevalent temperatures. In the case of high temperatures the cut-off voltage will be decreased, at low temperatures it will be increased.

### Gassing regulation

If a lead battery is operated for a longer period of time without a controlled gas development harmful acidic layers may be built. The solar controller eliminates or prevents, respectively the forming of acidic layers by means of controlled gassing. This behavior also depends on the temperature and is compensated by the integrated temperature sensor.

### LED indicator

The 3 LEDs inform about the real time charging condition as well as about the operation status of the battery.

## Features

- **Shunt charging regulation**
- **Pulse-width-modulated charging control (PWM)**
- **Suitable for lead-acid and lead-gel batteries**
- **Automatic voltage recognition 12 V/24 V**
- **Controlled, temperature-dependent gassing**
- **With integrated temperature sensor**
- **Temperature-compensated charging**
- **Low internal current consumption**
- **LED battery status indicator**
- **Robust plastic housing**
- **Protection against deep discharge and overcharging**

### Delivery content

- Solar controller 12 V/24 V, 6 A or 8 A
- Operation manual in DE, GB, FR, NL

Technical data	Solar Controller 12 V/24 V, 6 A	Solar Controller 12 V/24 V, 8 A
Battery system voltage	12 V/24 V	12 V/24 V
Supported battery types	Lead-acid, lead-gel	Lead-acid, lead-gel
Type of charge control	PWM Shunt	PWM Shunt
Maximum panel power	55 W/110 W	55 W/110 W
Maximum panel voltage	22 V/35 V	22 V/35 V
Maximum panel/charging current	5 A	8 A
Maximum load current	6 A	8 A
Internal current consumption	5 mA	5 mA
Fuse	6,3 A	10 A
Temperature sensor	Yes	Yes
Operation temperature range	-25 °C to +50 °C	-25 °C to +50 °C
Common ground potential (negative pole)	No	No
Switchable load output	No	No
Display	LED	LED
Housing	Plastic	Plastic
Dimensions (L x W x H)	98 x 88 x 35 mm	98 x 88 x 35 mm
Weight	120 g	120 g
Charging parameters		
Cut-off voltage	13.7 V/27.4 V	13.7 V/27.4 V
Cut-off voltage, gassing deactivated	14.1 V/28.2 V	14.1 V/28.2 V
Trickle charging	13.7 V/27.4 V	13.7 V/27.4 V
Trickle charging, gassing deactivated	14.1 V/28.2 V	14.1 V/28.2 V
Gassing active from	12.4 V/24.8 V	12.4 V/24.8 V
Gassing-end voltage	14.5 V/29 V	14.5 V/29 V
Temperature compensation	24 mV/K / 48 mV/K	24 mV/K / 48 mV/K
Temperature compensation, at gassing	18 mV/K / 36 mV/K	18 mV/K / 36 mV/K
Deep discharge protection load output		
Shut-off voltage	11.1 V/22.2 V	11.1 V/22.2 V
Reset voltage	12.6 V/25.2 V	12.6 V/25.2 V
Order no.	200032	200033

# SAFETY ACCESSORIES/ DEEP DISCHARGE PROTECTION



### Reliable protection against deep discharge

If a 12 V or 24 V DC electrical consumer shall be connected directly to the solar battery it is recommended to protect the valuable battery against deep discharge.  
Suitable devices: Deep Discharge Protection 12 V/24 V, 6 A as well as Deep Discharge Protection 12 V, 16 A.



Adjustable deep discharge protection

System voltage 12 V/24 V DC

Suitable batteries: lead-acid, lead-gel, AGM

CE

EU Made in Europe

3 years warranty

## Deep Discharge Protection 12 V/24 V, 6 A with battery status indicator

This cost-performance-strong deep discharge protection protects your valuable solar battery against deep discharging. It is suitable for the use with lead-acid, lead-gel and lead-AGM batteries. Depending on your requirements different shut-off and reset voltage values may be defined. The deep discharge protection is safe-guarded against short circuit by means of a 6.3 A fine wire fuse. The internal current consumption is only 3-6 mA.

### Features

- Suitable for lead-acid, lead-gel and lead-AGM batteries
- Factory setting: system voltage 12 V, optionally 24 V
- Dynamic deep discharge protection
- Conversion to constant deep discharge possible
- Intelligent surplus management
- Various shut-off thresholds selectable
- Set-up of a priority shut-off-based system by means of several devices possible
- LED status indicator
- Low internal current consumption
- Protected against short circuit

#### Priority principle

The priority principle offers the possibility to specify that electrical consumers will be disconnected in the order of their significance in the case of decreasing battery charge. For this, an individual deep discharge protection unit must be installed upstream of each electrical consumer. The desired shut-off voltage must be selected for each deep discharge protection unit.

#### Dynamic deep discharge protection

The dynamic deep discharge protection determines the battery's remaining capacity based on battery voltage and load current. With this, it offers a more intelligent protection than the conventional controller with constant load shut-off threshold. For example, the battery voltage at which electrical consumers with high current consumption are shut-off is lower than for electrical consumers with low current consumption. Yet, the remaining battery capacity after the shut-off is the same in both cases. As soon as the battery is recharged and the load reactivation threshold (reset voltage) has been exceeded the electrical consumers are automatically reconnected.

#### Clear LED status indicator

The battery's charging status can be read at a glance by virtue of the 3 LEDs. Furthermore, the LEDs indicate the impending deep discharge or if the load output has been disconnected already.

### Constant deep discharge protection

When using batteries with high internal resistance (small batteries or already sulfated batteries) the dynamic deep discharge protection can lead to an early load shut-off. The conversion to constant discharge-end voltage 11.1 V (for 12 V systems) or 22.2 V (for 24 V systems), respectively may eventually be a reasonable choice in order to retrieve more current from the battery.

Technical data	Deep Discharge Protection 6 A
Battery system voltage	12 V/24 V
Supported battery types	Lead-acid, lead-gel, lead-AGM
Maximum output power	73 W/146 W
Maximum load current	6.3 A
Switchable load output	no
Internal current consumption	3-6 mA
Fuse	6.3 A
Operation temperature range	-25 °C to +50 °C
Display	LED
Housing	Plastic
Maximum clamping range	2.5 mm²
Dimensions (L x W x H)	98 x 88 x 35 mm
Weight	120 g
Switching threshold	
Shut-off voltage, constant	11.1 V/22.2 V
Shut-off voltage, dynamic idle	12 V/24 V
Shut-off voltage, dynamic rated load	11.4 V/22.8 V
Shut-off voltage, surplus principle	13 V/26 V
Reset voltage, constant	12.6 V/25.2 V
Reset voltage, surplus principle	13.5 V/27 V
Priority principle	
Shut-off voltage, priority 1	11.1 V/22.2 V
Shut-off voltage, priority 2	11.3 V/22.6 V
Shut-off voltage, priority 3	11.7 V/23.4 V
Reset voltage, priority 1	12.6 V/25.2 V
Reset voltage, priority 2	12.7 V/25.4 V
Reset voltage, priority 3	12.8 V/25.6 V
Order no.	200030

i

Example of use - Priority shut-off for various devices in the vacation home

The electrical consumer's shut-off is defined by assigning a specific shut-off voltage to each individual deep discharge protection unit. Less important electrical consumers (e.g. TV) are connected to the deep discharge protection with the highest shut-off voltage (12 V). These devices will be disconnected first. If the battery voltage keeps decreasing the second deep discharge protection (shut-off voltage 11.7 V) deactivates electrical consumers with higher priority (e.g. lighting). The electrical consumers with the highest priority (e.g. emergency lighting, radio system) are connected to the third deep discharge protection (shut-off voltage 11.3 V) and are disconnected at last resort.

#### Delivery content

- Deep discharge protection 12 V/24 V, 6 A
- Operation manual in DE, GB, FR, NL



# SAFETY ACCESSORIES/ DEEP DISCHARGE PROTECTION



Adjustable deep discharge protection

System voltage 12 V DC

Suitable batteries: lead-acid, lead-gel, AGM

Switchable load output

CE

EU Made in Europe

3 years warranty

## Deep Discharge Protection 12 V, 16 A with battery status indicator

This compact deep discharge protection device protects your 12 V solar battery from harmful deep discharging. If the load shut-off voltage is reached the load is automatically disconnected with an acoustic signal. The shut-off voltage can be adjusted freely between 9 V and 14 V by means of the potentiometer. As soon as the battery voltage is higher than the selected shut-off threshold the load output (electrical consumer) can be activated again by means of push button.

Thanks to the clear LED status indicator you can instantly read if the device is ready to use, the battery is fully charged or if the load output if deactivated. The device is protected against short circuit by means of a 20 A flat fuse. The internal current consumption is low, only 15 mA idle, while with active load output it is max. 50 mA.

### Features

- Suitable for lead-acid, lead-gel and lead-AGM batteries
- System voltage 12 V
- Automatic shut-off for deep discharge protection
- Load shut-off adjustable between 9 V and 14 V
- Load shut-off factory setting 11.6 V
- Acoustic warning at load shut-off
- Push button for manual load on/off switching
- LED status indicator
- Low internal current consumption
- Protected against short circuit

### Delivery content

- Deep Discharge Protection 12 V, 16 A
- Operation manual in DE, GB, FR, NL

Technical data	Deep Discharge Protection 12 V, 16 A
Battery system voltage	12 V
Supported battery types	Lead-acid, lead-gel, lead-AGM
Maximum output power	190 W
Maximum load current	16 A
Switchable load output	Yes
Internal current consumption, idle	15 mA
Internal current consumption, load output active	50 mA
Fuse	20 A
Operation temperature range	-25 °C to +50 °C
Display	LED + acoustic
Housing	Plastic
Maximum clamping range	2.5 mm <sup>2</sup>
Dimensions (L x W x H)	98 x 88 x 35 mm
Weight	100 g
<b>Switching thresholds</b>	
Shut-off voltage, factory setting	11.6 V
Shut-off voltage, adjustable range	9 V - 14 V
Order no.	200031

# SECOND BATTERY CHARGER/ SMART CHARGING MANAGEMENT



For 12 V lead batteries up to 500 Ah

Suitable for solar home systems

CE

EU Made in Europe

3 years warranty

E1

## Second Battery Charger 12 V/80 A

With the intelligent charging management of the second battery charger the energy produced at peak time can be stored easily and effectively inside a secondary battery. The second battery charger regulates the primary charging into the main battery. If the main battery is full the device automatically switches to the second battery. Thus, both batteries within your solar stand-alone system or your vehicle will be charged.

If the battery voltage of the main battery drops below 12.8 V the connection between the two batteries will be interrupted automatically in order to protect it. Current can still be withdrawn from the second battery. It is essential that insignificant electrical consumers are only connected to the secondary battery.

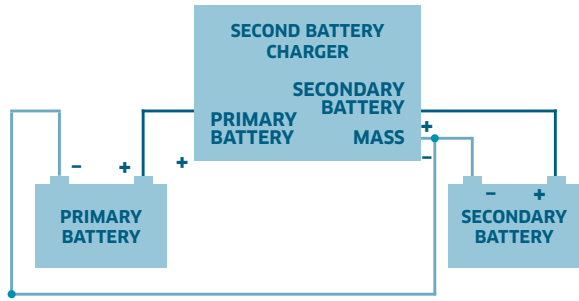
The electronic is suitable for all 12 V lead batteries, while its switching capacity is sufficient for batteries up to 500 Ah. The second battery charger is E-mark certified and thus, suitable for permanent mounting is all vehicles licensed for public traffic.

### Application possibilities

Solar stand-alone systems as well as private cars, motor homes, mobile homes, boat, tractor, bus, truck, construction vehicles and many others.

Technical data	Second Battery Charger 12 V/80 A
Battery voltage	12 V DC (2x)
Max. switching current	80 A (max. 5 Min.)
Normal load	60 A
Max. voltage	16 V DC
Operation voltage	0.6 V
Current consumption	5 mA
Operation current	300 mA
Secondary charging starts at	13.6 V
Secondary charging switches off at	12.8 V
Dimensions (L x W x H)	125 x 62 x 50 mm
Weight	400 g
Order no.	900003

### Connection schematic Second Battery Charger



### Application within a solar stand-alone system

Essential electrical consumers which must function at all times are connected to the main battery. For example: security systems or cooling devices. The secondary battery supplies less important electrical consumers with current such as, TV sets or radios.

### Application in a vehicle

Using a secondary battery is especially reasonable if an inverter is used within a vehicle's system. In the case that the secondary battery is discharged the motor can be started reliably using the main vehicle battery.

### Delivery content

- Second Battery Charger
- Operation manual in DE, GB, FR, NL



# DIGITAL SINE WAVE INVERTER SERIES DSW/ CONTINUOUS POWER 300-4000 W



## Absolutely self-sufficient thanks to true sine wave alternating voltage

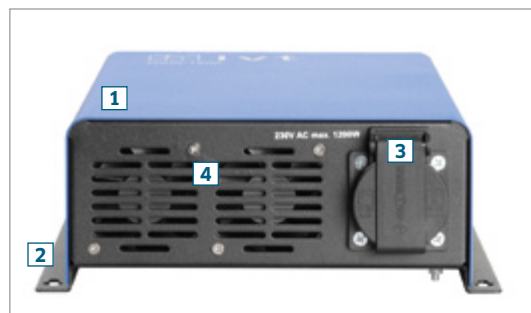
Digital Sine Wave Inverters of the DSW series offer an independent power supply wherever it is needed: on the go or stationary, as single unit or in combination with alternative energy sources such as solar or wind power.

They reliably and precisely convert an input voltage of 12 V or 24 V DC into a true sine wave alternating voltage of 230 V/50 Hz.

Independently of the public mains grid, even sensitive consumers such as measuring devices, pumps or machines with electronic controls, TV sets, monitors and many others can be safely supplied with power.

The IVT inverters offer a power range of 300 W – 2000 W continuous power and twice as much peak output power. Should this be not sufficient, you have the option of connecting two DSW-2000 synchronous devices in parallel. This achieves a continuous output of 4000 W.

Inverters of the DSW series and solar controllers of the MPPT<sup>plus</sup> series are perfectly attuned to each other. With the aid of Remote Control FB-04 or the Webbox LCD, you can control and monitor the devices individually. More information on pages 12-13.



- 1 Solid metal housing
- 2 Metal rails for secure mounting
- 3 230 V grounding-type socket
- 4 Temperature- and power-controlled fan



- 5 12 V or 24 V connection terminal for the battery
- 6 DIP switches for sleep/standby function and addressing
- 7 Connection terminals for remote control FB-04 and the Webbox-LCD
- 8 Connection terminal for remote switches FS-01, FS-02
- 9 5 V USB socket
- 10 Indicator for input and output voltage
- 11 Main switch ON/OFF

## The most important characteristics and features

- **Input voltage:** 12 V or 24 V DC
- **Output voltage:** true sine wave alternating voltage 230 V/50 Hz
- **Extensive power range:** continuous output power from 300 W to 4000 W
- **Double as high peak output power**
- **Particularly safe:** galvanic isolation of the input and output stages

## Further characteristics

- **Standardly equipped with overvoltage shut-off, overload management, short circuit shut-off and protective overheating switch**
- **Energy-saving standby function**
- **Dynamic deep discharge protection**
- **Power start function for electrical consumers with high inrush current**
- **Suitable for permanent mounting inside commercial vehicles thanks to the E-mark certification**
- **Monitoring and controlling of DSW inverters and MPPT<sup>plus</sup> solar controllers with only one remote control (FB-04) or from everywhere via PC by means of the Webbox-LCD**
- **5 V USB terminal**
- **Temperature range -25 °C to +60 °C**
- **Sturdy metal housing**

**i More information regarding the DSW inverters**  
Detailed information are available in the brochure "Digital Sine Wave Inverter Series DSW" as well as anytime on our webpage under: [www.ivt-hirschau.com](http://www.ivt-hirschau.com)





# DIGITAL SINE WAVE INVERTER SERIES DSW

## MODEL OVERVIEW & TECHNICAL DATA

Optionally remote-controlled

True sine wave

 CE

 Made in Europe

3 years warranty

 E1



Technical data	DSW-300/12 V	DSW-300/24 V	DSW-600/12 V	DSW-600/24 V	DSW-1200/12 V	DSW-1200/24 V	DSW-2000/12 V	DSW-2000/24 V	DSW-2000/12 V Synchron	DSW-2000/24 V Synchron
<b>Input</b>										
Nominal voltage DC	12 V	24 V	12 V	24 V	12 V	24 V	12 V	24 V	12 V	24 V
Voltage range DC	11 V - 16 V	22 V - 32 V	11 V - 16 V	22 V - 32 V	11 V - 16 V	22 V - 32 V	11 V - 16 V	22 V - 32 V	11 V - 16 V	22 V - 32 V
Nominal input current	25 A	12.5 A	50 A	25 A	100 A	50 A	200 A	100 A	200 A	100 A
Input current (max.)	31 A	15.5 A	62 A	31 A	124 A	62 A	248 A	124 A	248 A	124 A
Deep discharge protection voltage, idle	10.5 V	21 V	10.5	21 V	10.5	21 V	10.5	21 V	10.5	21 V
Deep discharge protection voltage, nominal	9.5 V	19 V	9.5 V	19 V	9.5 V	19 V	9.5 V	19 V	9.5 V	19 V
Deep discharge protection voltage, adjustable*	9 V - 12 V	18 V - 24 V	9 V - 12 V	18 V - 24 V	9 V - 12 V	18 V - 24 V	9 V - 12 V	18 V - 24 V	9 V - 12 V	18 V - 24 V
Advance warning of deep discharge protection switch-off	1 V above switch-off voltage	1 V above switch-off voltage	1 V above switch-off voltage	1 V above switch-off voltage	1 V above switch-off voltage	1 V above switch-off voltage	1 V above switch-off voltage	1 V above switch-off voltage	1 V above switch-off voltage	1 V above switch-off voltage
Switch-on voltage	12.5 V	25 V	12.5 V	25 V	12.5 V	25 V	12.5 V	25 V	12.5 V	25 V
Over-voltage switch-off	16 V	32 V	16 V	32 V	16 V	32 V	16 V	32 V	16 V	32 V
Nominal power consumption, idle	4 W	4 W	5 W	5 W	6 W	6 W	10 W	10 W	10 W	10 W
Nominal power consumption, standby	0.4 W	0.4 W	0.4 W	0.4 W	0.4 W	0.4 W	0.4 W	0.4 W	0.4 W	0.4 W
<b>Output</b>										
Output voltage AC (±2 %)	230 V <sub>eff</sub>	230 V <sub>eff</sub>	230 V <sub>eff</sub>	230 V <sub>eff</sub>	230 V <sub>eff</sub>	230 V <sub>eff</sub>	230 V <sub>eff</sub>	230 V <sub>eff</sub>	230 V <sub>eff</sub>	230 V <sub>eff</sub>
Frequency (±1 %)	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Signal characteristic	Sinusoidal	Sinusoidal	Sinusoidal	Sinusoidal	Sinusoidal	Sinusoidal	Sinusoidal	Sinusoidal	Sinusoidal	Sinusoidal
Continuous output current	1.3 A <sub>eff</sub>	1.3 A <sub>eff</sub>	2.6 A <sub>eff</sub>	2.6 A <sub>eff</sub>	5.2 A <sub>eff</sub>	5.2 A <sub>eff</sub>	8.7 A <sub>eff</sub>	8.7 A <sub>eff</sub>	8.7 A <sub>eff</sub>	8.7 A <sub>eff</sub>
Continuous output power	300 VA	300 VA	600 VA	600 VA	1200 VA	1200 VA	2000 VA	2000 VA	2000 VA	2000 VA
Peak output power (max. 2 s)	600 VA	600 VA	1200 VA	1200 VA	2400 VA	2400 VA	4000 VA	4000 VA	4000 VA	4000 VA
Power factor	cos phi > 0.8	cos phi > 0.8	cos phi > 0.8	cos phi > 0.8	cos phi > 0.8	cos phi > 0.8	cos phi > 0.8	cos phi > 0.8	cos phi > 0.8	cos phi > 0.8
Nominal efficiency	90 %	90 %	90 %	90 %	90 %	90 %	90 %	90 %	90 %	90 %
Standby activation, output power	< 50 VA	< 50 VA	< 70 VA	< 70 VA	< 80 VA	< 80 VA	< 50 VA	< 50 VA	< 50 VA	< 50 VA
<b>General</b>										
Input connector	Screw terminal	Screw terminal	Screw terminal	Screw terminal	Screw terminal	Screw terminal	Screw terminal	Screw terminal	Screw terminal	Screw terminal
Output connector	Isolated ground socket	Isolated ground socket	Isolated ground socket	Isolated ground socket	Isolated ground socket	Isolated ground socket	Isolated ground socket	Isolated ground socket	Isolated ground socket	Isolated ground socket
Suitable plug type	F, C	F, C	F, C	F, C	F, C	F, C	F, C	F, C	F, C	F, C
Output terminal USB (Type A)	5 V/500 mA DC	5 V/500 mA DC	5 V/500 mA DC	5 V/500 mA DC	5 V/500 mA DC	5 V/500 mA DC	5 V/500 mA DC	5 V/500 mA DC	5 V/500 mA DC	5 V/500 mA DC
Temperature range (66 % nominal power)	-25 °C to +60 °C	-25 °C to +60 °C	-25 °C to +60 °C	-25 °C to +60 °C	-25 °C to +60 °C	-25 °C to +60 °C	-25 °C to +60 °C	-25 °C to +60 °C	-25 °C to +60 °C	-25 °C to +60 °C
Temperature range (100 % nominal power)	-25 °C to +40 °C	-25 °C to +40 °C	-25 °C to +40 °C	-25 °C to +40 °C	-25 °C to +40 °C	-25 °C to +40 °C	-25 °C to +40 °C	-25 °C to +40 °C	-25 °C to +40 °C	-25 °C to +40 °C
Sleep function	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable
Standby function	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable
Galvanic isolation (input/output)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Powerstart function	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-certification	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Remote controllable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dimensions (L x W x H)	263 x 164 x 88 mm	263 x 164 x 88 mm	277 x 234 x 88 mm	277 x 234 x 88 mm	391 x 234 x 88 mm	391 x 234 x 88 mm	391 x 334 x 88 mm	391 x 334 x 88 mm	391 x 334 x 88 mm	391 x 334 x 88 mm
Weight	1.8 kg	1.8 kg	2.9 kg	2.9 kg	3.5 kg	3.5 kg	4.8 kg	4.8 kg	5.2 kg	5.2 kg
Order no.	430101	430102	430103	430104	430105	430106	430107	430108	430109	430110

\*Only with FB-04 or Webbox.

# ACCESSORIES/ DSW INVERTERS

## Our plus: the equipment

With our original IVT accessories, you can adapt your inverter to your individualized requirements. You only pay for equipment you actually need. And you can rely on the typically good IVT quality as usual.



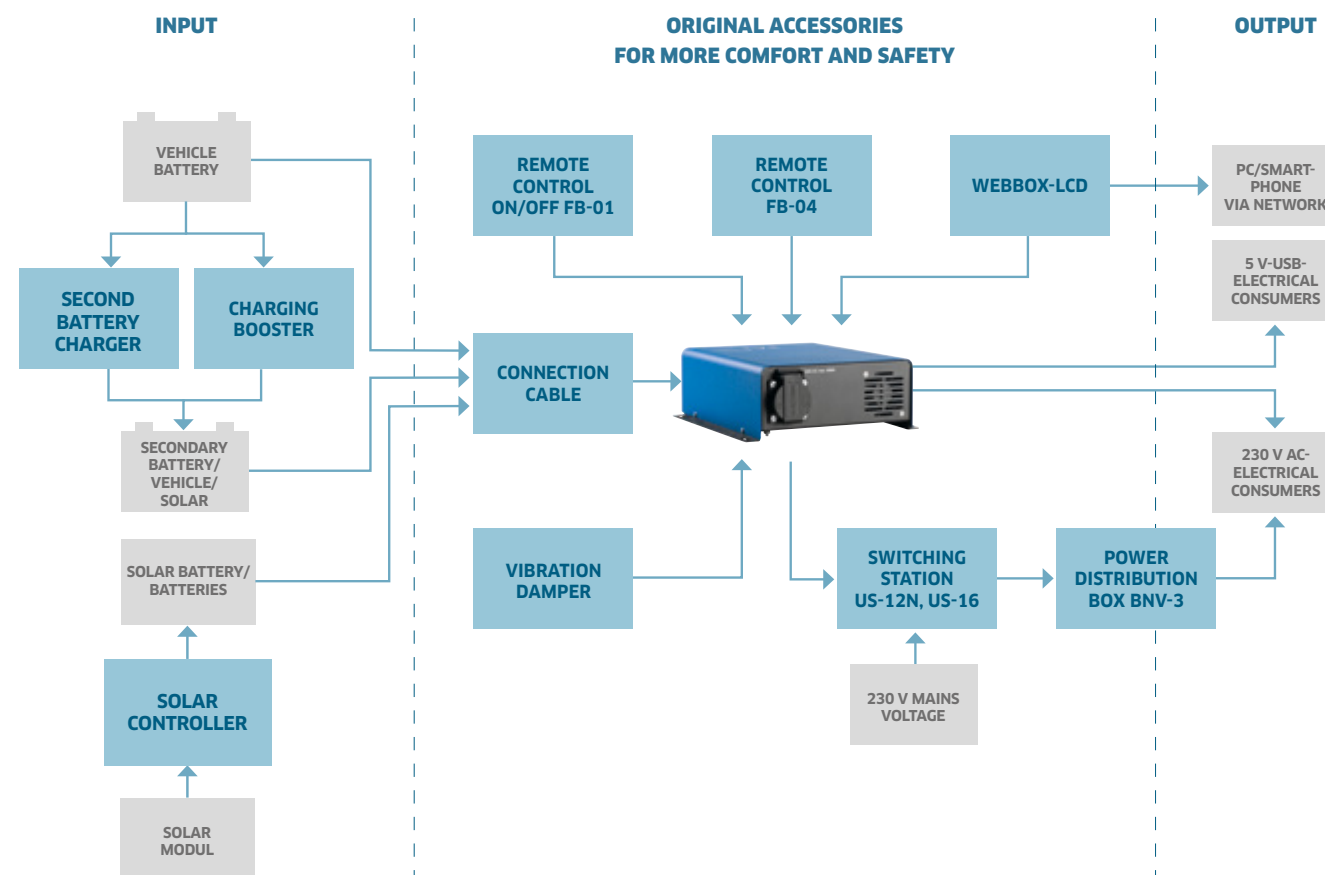
3 years warranty



3 years warranty



3 years warranty



## Connection cable set for DSW inverters

IVT connection cables are safe, and regarding the conductor's cross section and cable length exactly attuned to the respective inverter. The high quality workmanship of our connection cables assures a particularly long lifetime even at high encumbrance.

The cable set is already fitted with matching eyelet rings and cable end sleeves for a connection to the battery and to the inverter. The color-coded cable ends (red = connection to positive pol / black = connection to negative pol) support a quick and polarity-safe connection to battery and inverter. All original IVT connection cables are delivered including the fuse holder with a 200 A fuse.

**Please consider** that each synchronized inverter requires its own set of connection cables.

**Available cables**  
A list of all available connection cable setss (standard, Mercedes Sprinter) for the DSW series can be found at [www.ivt-hirschau.com](http://www.ivt-hirschau.com) and under the respective inverter model.

## Synchron connection cable for DSW-2000-Synchron

With this Synchron connection cable you can link 2 DSW-2000-Synchron Inverters in parallel. Hence, the capacity of the system will be increased to 4000 W. The cable length is 1.0 m.

Order no. 431007



**In the Synchron operation mode each DSW-2000-Synchron requires its own set of connection cables.**

## Vibration damper set for DSW Inverters

The vibration dampers protect your inverter against shocks and vibrations. Basically, we recommend the use of vibration dampers for applications during extreme conditions of shock. An absorption grade of up to 77 % will be achieved, while the life span of your inverter will be significantly increased. Simply fasten the 4 vibration dampers by means of the 8 self-locking nuts and the 8 washers between the base and the inverter.

Technical data	
Material	natural rubber, galvanized steel
Total height	5.5 cm
Rubber height	2.5 cm
Rubber width	2.0 cm
Thread	M6
Thread length	1.5 cm

Order no. 430117



**Important notice for 12 V inverters DSW-2000 and DSW-2000-Synchron**  
Due to the high current flow on the battery side, please use only cables with a minimum cross section of 50 mm<sup>2</sup> for the DSW-2000 and DSW-2000-Synchron in the 12 V version.



# MANUFACTURER SERVICE/ ADDED VALUE FOR YOU AND YOUR CUSTOMERS

## Here's to a fair partnership

As manufacturer it is of great importance to us that you and your customers are always fully satisfied with our products. In addition to premium class products, we offer you a wide range of service and counselling measures as well as assist you with the distribution of our products upon request.

## Our extensive offer includes the following services



### Employee training

Only employees who are masters of their craft are able to develop the best solutions for their customers. Our training staff provides your employees in the sales and customer service department with the knowledge and the security for an optimum product recommendation and offers further tips regarding the professional installation of our devices.



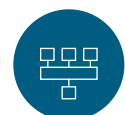
### 3 years manufacturer warranty

We are fully convinced of the performance, technology and workmanship of our products. Therefore, we offer you a 3 year manufacturer warranty. Of course, this is also valid for products which have been built, modified and designed according to your wishes and requirements.



### Individualized sales promotions

Adapted to suit the advertising activities of your company, we gladly support you with advertisement material, displays for your sales room or other promotional measures.



### Custom development

Your customer have big plans? We gladly support you with the development of customized solutions for you and your customers. Contact us and take advantage of our long-standing experience.

We are available

**Monday to Thursday from 08.00 – 17.00, Friday 8.00 – 12.00**  
under the following phone number:

# +49 9622 719910



### Repair service

It goes without saying that our repair work is carried out quickly and carefully. Repaired devices will be returned to you within 7 work days. After the warranty period has expired, we will provide an estimate of the costs in advance.



### Spare parts service

If you wish to repair the device yourself, we deliver the required spare parts even years later. Please consider, though, that repair works may only be performed by authorized professional staff.



### Personal advice

You have further questions? Our qualified staff gladly provides assistance and advice regarding all questions about inverters, voltage converters, solar technology, charging technology as well as portable light. Contact us.

Phone: **+49 9622 719910**

E-mail: **support@ivt-hirschau.de**



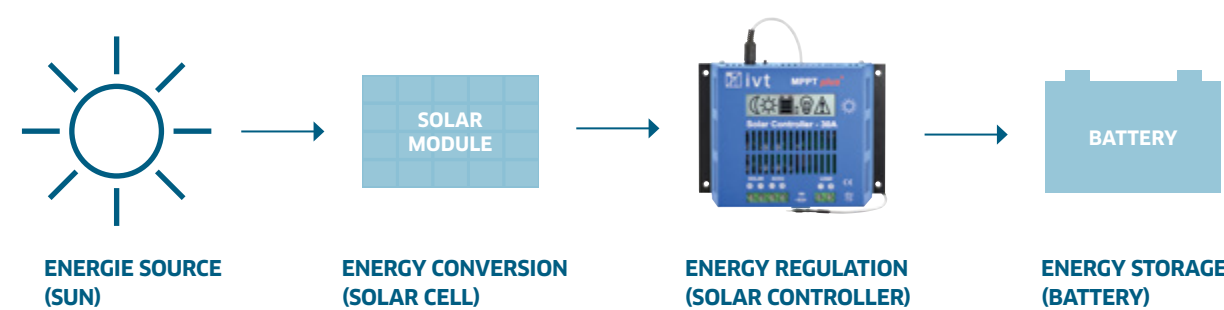
### OEM-Service

You would like our products in an individualized housing or design? Or you require different technical specifications? We gladly attune our products according to your requirements or acquire individualized solutions for you.

# THINGS TO KNOW ABOUT SOLAR TECHNOLOGY

## WHY DO I NEED A SOLAR CONTROLLER

Solar controllers are used to feed solar energy in a regulated manner into a suitable energy storage system. The radiative energy of the sun is converted into electrical energy by means of a solar cell respectively by a solar module. The solar controller assures subsequently that this electrical energy is fed precisely and gently into a battery.



## THE BATTERY AS ENERGY STORAGE SYSTEM

Batteries are used to store electrical energy. Various technologies for manufacturing such energy storage systems are available on the battery market. Yet the typical characteristics are always the rated voltage (V) and the capacity (Ah).

Due to the cost factor the lead batteries are the predominant type used in the solar technology. For this reason, most solar controllers are specifically attuned for this battery type. Lithium Iron Phosphate batteries (LiFePO4) are energy storage systems of the newest generation and are well suitable for replacement of the existing lead battery systems, specifically due to their comparably low weight, as they have identical electrical properties.

For lead batteries a distinction is made between the following types:

- Classic, open lead-acid batteries
- Lead-gel batteries
- Lead-Absorbant-Glas-Matt batteries (lead-AGM batteries)

Especially when charging and discharging a battery it is important to adopt several criteria:

- The maximum charging current should be around 10 % of the battery capacity.
- The cut-off voltage advised by the manufacturer must not be exceeded.
- Deep-discharging the battery must be avoided.

A solar controller must fulfil these criteria in order to allow for an optimum use of the battery and assure a long duty cycle of the often expensive energy storage system.

## SOLAR CELL / SOLAR MODULE

A solar module consists of several interconnected solar cells and serves for converting the radiative energy of the sun into electrical energy. Direct voltage is provided on the terminals of the radiated solar module. If the module is operated within a closed current circuit direct current is available.

The subsequent diagram shows the idealized current/voltage characteristic of a solar module:

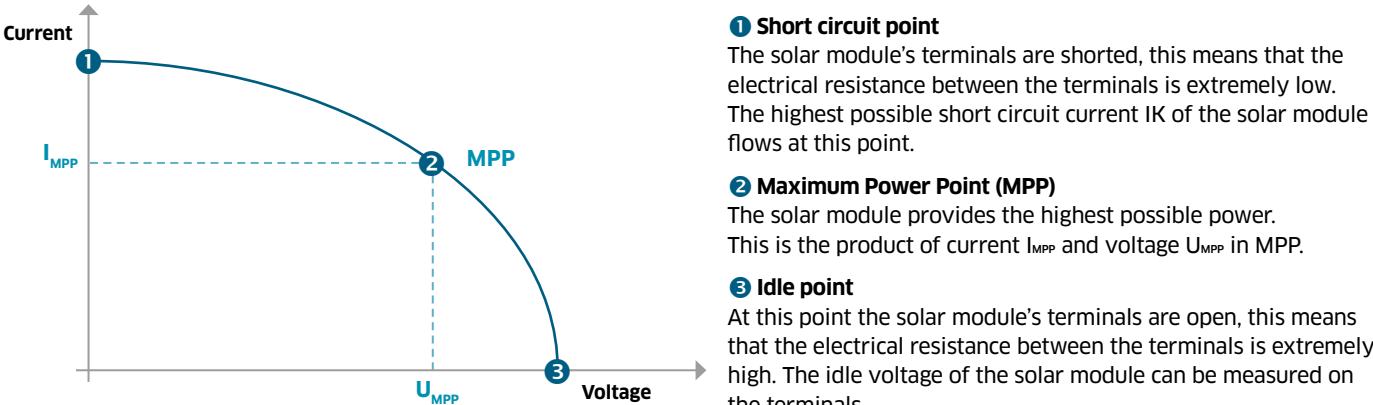


Chart 1: Current/voltage characteristic of a solar module.

The working point moves between point 1 and 3, depending on which electrical consumer is connected to the solar module.

## CHARGING METHODS

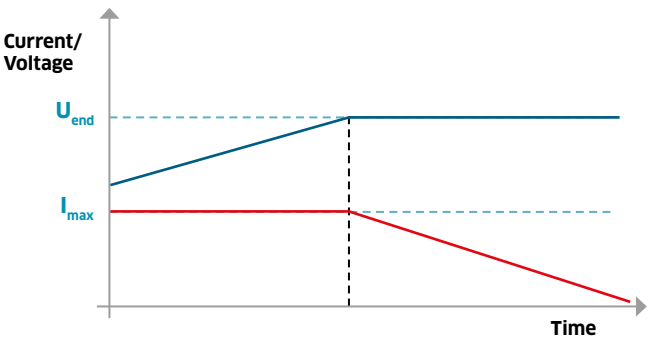


Chart 2: Charging characteristic constant voltage charging.

### Charging with constant voltage (U-Ladung)

At the constant voltage charging the charging (end) voltage U<sub>end</sub> will be kept constant during the entire charging process. As a result, at the beginning of the charging process the flowing current I<sub>max</sub> is higher than at the end. With the decreasing current towards the end of the charging process the charging of the battery is gentle.

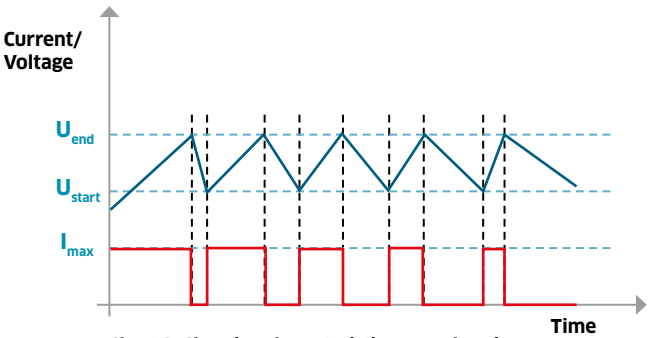


Chart 3: Charging characteristic PWM-charging.

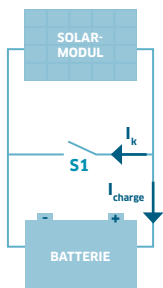
### Charging by pulse-width-modulation (PWM)

When charging according to the pulse-width-modulation principle at the beginning of the charging process the battery is charged with maximum current I<sub>max</sub>. As soon as the cut-off voltage U<sub>end</sub> is reached, the current flow is stopped in order to avoid overcharging. After this first charging step the battery is not fully charge most of the time. A decrease of the battery voltage is to be expected. For this reason, the charging current restarts if the voltage U<sub>start</sub> falls short of a certain value. This process is repeated until the battery is completely full. The charging current phases become shorter as the battery fills up.



## TYPES OF CHARGING REGULATION

### Shunt regulation



During the charging process the solar module is connected with the battery via charge controller and charging current  $I_{\text{charge}}$  is fed from the solar module to the battery. Yet, this process is only given if the solar voltage is higher than the required cut-off voltage of the battery. If this cut-off voltage is reached, this is recognized by the charge controller and the solar cell is shorted via contact S1. Thus, the current flow from the solar module to the battery is stopped. With this, overcharging and damage to the battery is prevented.

The entire current  $I_k$ , provided by the solar module flows to the closed short circuit contact and will be converted to heat within the charge controller. On the solar module diagram (chart 1) the working point moves to point 1 at full battery condition. During the charging process the working point is between point 1 and 2.

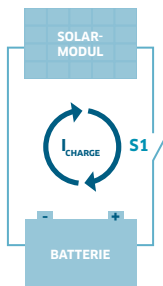
#### Advantages

- Fast regulation
- Simple switching mode

#### Disadvantages

- Not suitable for high power
- Solar power is not used in an optimum manner

### Serial regulation



The solar module is connected with the battery which is to be charged by means of the charge controller and charging current  $I_{\text{charge}}$  is fed into the battery. Yet, this process is only given if the solar voltage is higher than the required cut-off voltage of the battery. If the cut-off voltage is reached, the charge controller detects this and disconnects the battery by means of the switch contact S1. With this, the current flow to the battery is stopped. Thus, overcharging and damage to the battery is prevented.

On the solar module diagram (chart 1) the working point moves to point 3 at full battery condition. During the charging process the working point is between 1 and 2.

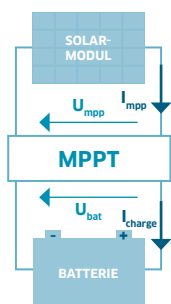
#### Advantages

- Also suitable for higher power
- Simple switching mode

#### Disadvantage

- Solar power is not used in an optimum manner

### MPPT regulation



By virtue of the Maximum Power Point Tracker (MPPT) it is achieved that at all times the maximum possible solar power  $P_{\text{mpp}}$  is converted into the maximum possible charging power  $P_{\text{bat}}$  for the connected battery.

$$P_{\text{mpp}} = P_{\text{bat}}$$

$$U_{\text{mpp}} \cdot I_{\text{mpp}} = U_{\text{bat}} \cdot I_{\text{bat}}$$

The MPPT function determines the working point of the solar panel at which the maximum solar power  $P_{\text{mpp}}$  is available (chart 1: point 2). This maximum power is processed by the MPPT into the required battery charging voltage  $U_{\text{bat}}$  and the corresponding charging current  $I_{\text{charge}}$ . Charge controllers without this function are not able to process excessive voltage. Charge controllers with this function are able to also take advantage of the excessive voltage.

#### Advantages

- Solar power is used in an optimum manner
- Suitable for solar modules with higher voltage

#### Disadvantage

- Complex switching electronic



Innovative  
Versorgungstechnik GmbH

#### **IVT Innovative Versorgungstechnik GmbH**

Dienhof 14  
D-92242 Hirschau

fon +49 9622 719910  
fax +49 9622 7199120

info@ivt-hirschau.de  
www.ivt-hirschau.de

#### **IMPRINT**

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Helmut Staudte

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