Contents

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Panelectron

SW sine wave inverters

Design and power encased
The SW sinewave inverter family is a new generation based on many years of inverter development and design. Taking all the power range between 150W and 2000W the SW inverters offer great reliability and durability combined with attractive design. The circuit board of the units is assembled by modern SMD technology that is built in an appealing anodized aluminium housing.

True sinusoidal output waveform
In order to run ANY type of electronic equipment from an inverter, you will need a high-quality sine-wave inverter. We guarantee that our inverters possess a stable sinusoidal output, which is necessary for many sensitive appliances and recommended for others.

Overload tolerance with heavy loads
The SW inverters possess increased capability of starting difficult inductive loads (e.g. motors).

Extensive protections against unintentional damage by user
When permanently overloaded, the SW inverters switch off automatically and wait until overload condition ceases, then it restarts automatically (no manual resetting necessary). Its electronic protection system survives even short circuit at the output after which the unit remains intact and fully operational. The SW inverter units are also protected against reverse polarity connection to the batteries.

Technical Data

	SW-100-12V	SW-150-12V	SW-150-24V	SW-300-12V	SW-300-24V
Input voltage DC	12V	12V	24V	12V	24V
Input voltage range	11-15V	11-15V	22-30V	11-15V	22-30V
Max. input current	10A	18A	9A	35A	18A
Battery low voltage – advance warning	12V	12V	23V	12V	23V
Inverter disconnect at low battery	10,5V	10,5V	21V	10,5V	21V
Inverter reconnect at recharged battery	12,5V	12,5V	25V	12,5V	25V
Standby current consumption (no load)	2,5VA	2,4VA	3,6VA	3,6VA	4,8VA
DC fuse protection	1 x 15A	1 x 20A	1 X 15A	1 X 40A	1 X 20A
Continuous output power rating	100VA	150VA	150VA	300VA	300VA
Peak output power rating	200VA	300VA	300VA	600VA	600VA
Output voltage AC	225V	225V	225V	225V	225V
Frequency (+/-1%) at 12V/24V DC IN	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Max. output current (continuous/peak)	0,45/0,9 A_{eff}	0,7/1,5 A_{eff}	0,7/1,5 A_{eff}	1,4/3 A_{eff}	1,4/3 A_{eff}
Efficiency	above 88%	above 88%	above 88%	above 88%	above 88%
Connection to battery	cigarette lighter	cigarette lighter	cigarette lighter	pole terminal	pole terminal
Output power outlet type	1 × EURO	1 × Schuko	1 × Schuko	1 × Schuko 1 × Euro	1 × Schuko 1 × Euro
Fan cooling	no	no	no	no	no
Can be operated by remote control	no	no	no	yes	yes
Dimensions (mm)	170×50	120x245x70	120x245x70	240x245x70	240x245x70
Weight	0,5 kg	1,3 kg	1,3 kg	2,7 kg	2,7 kg

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	SW-600-12V	SW-600-24V	SW-1200-12V	SW-1200-24V	SW-2000-12V	SW-2000-24V
Input voltage DC	12V	24V	12V	24V	12V	24V
Input voltage range	11-15V	22-30V	11-15V	22-30V	11-15V	22-30V
Max. input current	70A	35A	140A	70A	220A	110A
Battery low voltage – advance warning	12V	23V	12V	23V	12V	23V
Inverter disconnect at low battery	10,5V	21V	10,5V	21V	10,5V	21V
Inverter reconnect at recharged battery	12,5V	25V	12,5V	25V	12,5V	25V
Standby current consumption (no load)	4,2VA	6VA	10,8VA	12VA	18VA	21,6VA
DC fuse protection	2 X 40A	2 X 20A	4 x 40A	4 x 20A	8 x 40A	8 x 20A
Continuous output power rating	600VA	600VA	1200VA	1200VA	2000VA	2000VA
Peak output power rating	1200VA	1200VA	1800VA	1800VA	3000VA	3000VA
Output voltage AC	225V	225V	225V	225V	225V	225V
Frequency (+/-1%) at 12V/24V DC IN	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Max. output current (continuous/peak)	2,8/5,6 A_{eff}	2,8/5,6 A_{eff}	5,6/11,2 A_{eff}	5,6/11,2 A_{eff}	9,3/18,6 A_{eff}	9,3/18,6 A_{eff}
Efficiency	above 88%	above 88%	above 88%	above 88%	above 88%	above 88%
Connection to battery	pole terminal	pole terminal	pole terminal	pole terminal	pole terminal	pole terminal
Output power outlet type	1 × Schuko 1 × Euro	1 × Schuko 1 × Euro	1 × Schuko 1 × Euro	1 × Schuko 1 × Euro	1 × Schuko 1 × Euro	1 × Schuko 1 × Euro
Fan cooling	yes	yes	yes	yes	yes	yes
Can be operated by remote control	yes	yes	yes	yes	yes	yes
Dimensions (mm)	340x245x70	340x245x70	390x245x70	390x245x70	455x245x70	455x245x70
Weight	3,5 kg	3,5kg	4,5 kg	4,5 kg	5,2 kg	5,2 kg

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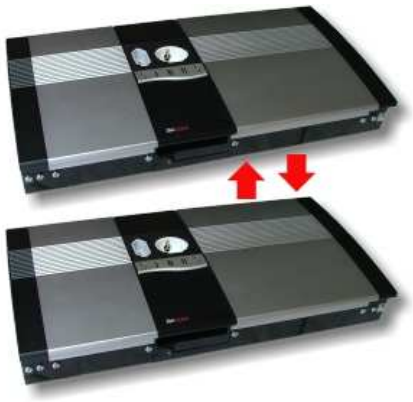
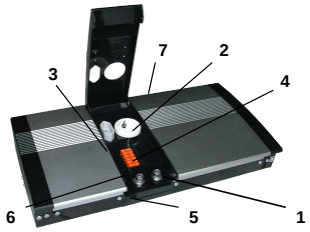
SW2000 SYNC sine wave inverters



4 kVA power for demanding applications
The SW2000 SYNC inverter is capable of being parallel-connected with another SW2000 SYNC model rendering a 4000VA continuous power for heavy loads or high start-up currents.

Description
The two SW2000 SYNC inverter models can be parallel connected via a synchron-cable which is provided for these models. One single unit of the SW2000 SYNC model can also be used as a standard stand-alone SW2000 inverter with output power of 2kVA. When connecting two SW2000 SYNC units in parallel, the 4kVA output power can be taken from any of the two units (power sharing) which means that e.g. you can connect one large 3500W load to the output socket of one of the inverters or you can connect several smaller loads using the output sockets of both inverters.



1. 12V/24Vdc connections
2. 230Vac output sockets
3. LED indicator
4. DC fuses
5. ON/OFF switch
6. outlet for remote control
7. Synchron-cable connection (on rear-side)

Technical Data

	1× SW-2000-12 SYNC as single unit	2 × SW2000-12 SYNC in parallel operation	1 × SW-2000-24 SYNC as single unit	2 × SW2000-24 SYNC in parallel operation
Input voltage (dc)	12V	12V	24V	24V
Input voltage range	11-15V	11-15V	22-30V	22-30V
Max. input current	220A	440A	110A	220A
Battery low - warning	12V	12V	23V	23V
Battery low - switch off	10,5V	10,5V	21V	21V
Battery recharged - switch on	12,5V	12,5V	25V	25V
Stand-by consumption	18VA	36VA	21,6VA	43VA
DC fuse protection	6 x 40A	6 x 40A	6 x 20A	6 x 20A
Continuous output power	2000VA	4000VA	2000VA	4000VA
Peak output power	3000VA	6000VA	3000VA	6000VA
Output voltage (ac)	225V	225V	225V	225V
Frequency (+/-1%)	50 Hz	50 Hz	50 Hz	50 Hz
Max. output current (continuous/peak)	9,3/18,6 A_{eff}	19/28 A_{eff}	9,3/18,6 A_{eff}	19/28 A_{eff}
Efficiency	above 88%	above 88%	above 88%	above 88%
Input type	pole terminal	pole terminal	pole terminal	pole terminal
Output power outlet	1 × Schuko 1 × Euro	1 × Schuko 1 × Euro	1 × Schuko 1 × Euro	1 × Schuko 1 × Euro
Fan cooling	yes	yes	yes	yes
Can be operated by remote control	yes	yes	yes	yes
Dimensions (mm)	455x245x70	2×(455x245x70)	455x245x70	2×(455x245x70)
Weight	5,2 kg	2×(5,2 kg)	5,2 kg	2×(5,2 kg)
"E" Mark reg. Number	e1 024372			

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US-12N by-pass station

Description

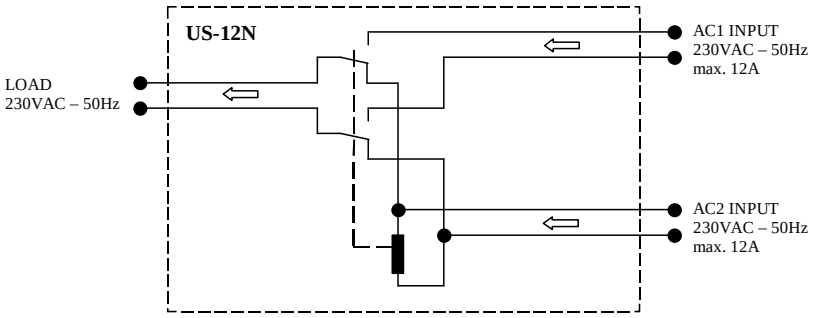
The US-12N microprocessor-controlled automatic transfer switch has two 230Vac inputs (AC1 and AC2) for two different power sources (mains, inverter, generator, etc.). As default, the 230Vac loads are supplied from the power source which is connected to the AC2 input. When this power source is no longer available (power failure, inverter deep-discharge disconnection, etc.), the loads are transferred automatically and safely to the AC1 power source.

Mobile applications: while on the road (car, campers, caravans, boats, etc.), your 230Vac loads on board can be fed by the inverter which converts your battery voltage into 230V / 50Hz. Whenever there is utility voltage available near your vehicle (e.g. campsite), simply plug in, your US-12N device will detect the mains voltage at its input and it automatically switches the load over to the mains. No need for re-cabling and disconnecting your whole inverter system (Mains: AC2; Inverter: AC1)

Stationary applications: the US-12N bypass station can also be used in conjunction with an inverter and batteries as part of a UPS (uninterrupted power supply) system. The loads are fed by the 230Vac mains voltage which, in case of a black-out, are transferred automatically to the inverter's output (Mains: AC2; Inverter: AC1)
In some applications where there is a stand-alone solar or wind system with available mains supply, one can choose to use up the energy stored in the batteries first and when the inverter disconnects due to low battery voltage (LVD), the US-12N switch transfers the loads to the mains (Mains: AC1; Inverter: AC2)

Installation

The installation must be carried out by a qualified professional. Wiring is to be done in accordance with the corresponding regulations. The Loads (Verbraucher) and the two power source (AC1 and AC2 connections are on screw terminals inside the IP55 rated enclosure. The protective earth (PE) wires must be connected together in a separate screw terminal (provided in the box). If the connected inverter does not have an earth connection, the battery pole, which is earthed, must be connected together with the protective earth of the mains and load.



Specifications

Nominal voltage:	230 V AC ~ 50 Hz
Contacts:	max. 230 V AC ~ 50 Hz
Switch-over time:	less than 1 sec (not uninterrupted nor synchronised)
Max. current:	12 A
Max. output power:	2.760 VA
Dimensions (L × W × H):	130 × 130 × 60 mm
Weight:	300 g

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PSR solar charge controllers

PSR4 This small solar charge controller is ideally suited for low-power applications. It optimally charges a 12 / 24V battery (jumper-selectable) with **4 Amps**, without overcharging it.
PSR4A The advance version of PSR4 is designed to control a DC load output as well. The load is automatically disconnected when the battery voltage level reaches a pre-set value (Deep Discharge Protection) and automatically reconnected when it was recharged sufficiently.

PSR8 Possesses all properties of the PSR4A with an **8 Amps** battery-charging capacity, plus: Temperature compensated charging enables to control the Gas-formation within the battery and ensures most appropriate charging characteristics at various temperatures. The 12/24V selector jumper was replaced by the automatic 12/24V battery voltage detection.

PSR20 The biggest within the PSR regulator range. The **20 Amps** charging power makes it more powerful than the PSR8, designed and suited for not only domestic but also for industrial applications.

The use of lead-acid batteries for storing solar energy in photovoltaic solar systems is the most widespread. These batteries must be protected against overcharging and deep-discharging. The PSR charger units satisfy both requirements. The 12 / 24 V voltage selection switch enables the charger units to operate with both kinds of solar systems. Longer operation of lead-acid batteries without gas-control can lead to the build-up of damaging acid formation. The PSR8 and PSR20 chargers regulate the temperature-dependent gas disengagement inside the battery by utilizing their temperature sensors.

Specifications

Models	PSR4	PSR4A	PSR8	PSR20
Battery voltage	12 / 24 V (jumper)	12 / 24 V (jumper)	12 / 24 V (automatic)	12 / 24 V (automatic)
Max. PV charging current	4 A	4 A	8 A	20 A
Max. DC load current	4 A	4 A	8 A	20 A
Max. power consumption	0,6 mA	1,5 mA	3 mA	4 mA
Temperature sensor	-	-	Built-in	Cable-connected
Charging voltage				
Boost charge	-	-	14,5 / 29 V	14,5 / 29 V
Float / normal charge	13,8 V / 27,6 V	13,8 V / 27,6 V	13,7 / 27,4 V	13,7 / 27,4 V
Boost charge restart at	-	-	12,4V / 24,8V	12,4V / 24,8V
Temp. compensation	- 4 mV/K/cell	- 4 mV/K/cell	- 4 mV/K/cell	- 4 mV/K/cell
Deep discharge protection				
DC load disconnection	-	10,5 V / 21 V	11,1 / 22,2 V	11,1 / 22,2 V
DC load reconnection	-	12,5 V / 25 V	12,6 / 25,2 V	12,6 / 25,2 V
Gas control activated				
charging voltage	-	-	14,1 / 28,2 V	14,1 / 28,2 V
Built-in fuse	-	-	10A	20A
Indication for “battery full” and “battery charging”	2 LEDs	2 LEDs	2 LEDs	2 LEDs
Temperature range	-10°C up to +50°C	-10°C up to +50°C	-25 °C - +50 °C	-25 °C - +50 °C
Dimensions (L × W × H)	68 × 57 × 28 mm	68 × 57 × 28 mm	95 × 95 × 35 mm	190 × 100 × 85 mm
Weight approx.	150 g	150 g	240 g	300 g
EMC Directive (89/336/EEC)	EN50081-1:01.92; EN50082-1:01.92			

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PSR solar charge controller with light sensor and timer

This new member of the PSR solar charge controller family has been specifically developed for intelligent applications where switching on and off the DC loads is expected to be done automatically, with the help of external light. Such fully automatic operations include solar billboard illuminations, solar streetlights, solar garden lights, solar weather stations, marine indication lights, etc. With the help of the PSR10-LS the connected loads are switched on upon dusk and continue operating for an adjustable period of time. In order to save the battery's lifetime, the DC loads will be disconnected when the battery's voltage reaches the DDP level, no matter if the timer is still running. Also , the PSR10-LS solar charge controller can be used as a normal solar regulator without light control, if the light sensor is removed.

Description

Including an additional light sensor, the PSR10-LS is capable of detecting the external light intensity and connect / disconnect the 12V or 24V DC load when the light intensity is decreased / increased to a certain level.

Setting light sensitivity level: As the light sensitivity level is adjustable by a trimmer, it is possible to select the most appropriate time for the load to switch on.

Setting lighting time: Another adjustable feature which is offered by the PSR10-LS is the adjustable illumination time which can be set between approx. 0,5 … 5,5 hours. After the set lighting time is over, the DC load will be switched off automatically.

Built-in or external light sensor: Also the appropriate light sensor is delivered with each PSR10-LS unit, connected to the local screw-terminal. With the help of a few metres of thin cable it is possible to put the light sensor in an open area when the controller itself is mounted in a closed place. This is particularly useful when the solar charger must be protected from the outside weather (rain, etc.) but also must be controlled by light.

Specifications

Models	**PSR10-LS**
Nominal voltage	12 / 24 V (jumper-selectable)
Charging current (solar cells)	10 A
Max. load	10 A
Max. power consumption	3 mA
Temperature sensor	Built-in
Charging voltage	
Normal	13,8 / 27,6 V
Deep discharge protection (DDP)	
DC load disconnection	10,5 / 21 V
DC load reconnection	12,5 / 25 V
Light control	
Light sensor type	Photo resistor
Light sensitivity level	Adjustable by a trimmer
Timer	
Lighting time	Adjustable between 0,5 … 5,5 hours by a trimmer
Built-in fuse	10A
Indication for "battery full" and "battery charging"	2 LEDs
Temperature range	-25 °C - +50 °C
Dimensions (L × W × H)	95 × 95 × 35 mm
Weight approx.	240 g
EMC Directive (89/336/EEC)	EN50081-1:01.92; EN50082-1:01.92

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PSX solar charge controllers

As a result of a late development, the PSX solar chargers appeared among our existing solar charge controllers with high expectations. The range currently consists of two models, the PSX182 (6A) and the PSX199 (8A), both regulators are made using highly reliable SMD components.

An automatic pv-system voltage detection function was also included in the controller (beside the temperature-compensated charging and gas-regulation functions), which reduces the risk of damage during incorrect installation.

The units are built in a nicely designed plastic case which makes them more appealing and up-to-date.

Specifications

Models	**PSX182**	**PSX199**
Nominal voltage	12 / 24 V (automatic)	12 / 24 V (automatic)
Charging current (solar cells)	6 A	8 A
Max. load	6 A	8 A
Max. power consumption	2-5 mA	2-5 mA
Temperature sensor	In-built	In-built
Final charging voltage limit		
Normal	13,7 V / 27,4 V	13,7 V / 27,4 V
Gas-control deactivated	14,1 V / 28,2 V	14,1 V / 28,2 V
Temp. compensation	-4mA/K/Cell	-4mA/K/Cell
Deep discharge protection		
Load disconnection	11,1 V / 22,2 V	11,1 V / 22,2 V
Load reconnection	12,6 V / 25,2 V	12,6 V / 25,2 V
Gas regulation		
Gas-control activation voltage	12,4 V / 24,8 V	12,4 V / 24,8 V
Final - gas-control voltage limit	14,5 V / 29 V	14,5 V / 29 V
Temperature compensation	-3 mA/K/Cell	-3 mA/K/Cell
Built-in fuse	6,3A	10A
Indication for “battery full”, “battery charging” and “overload”	3 LEDs	3 LEDs
Temperature range	-25°C - +50°C	-25°C - +50°C
Dimensions (L × W × H)	98 x 88 x 35 mm	98 x 88 x 35 mm
Weight approx.	120 g	120 g
EMC Directive (89/336/EEC)	EN50081-1:01.92; EN50082-1:01.92	

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PSC solar charge controllers

- PWM series regulation
- Automatic system voltage detection 12/24 V
- Temperature-compensated charging with Gas control
- Deep discharge Protection (DDP) with advanced warning
- PV module and DC load disconnection
- Suitable for power sources other than solar cells
- Optional LCD display and RS232 port

Microcontroller-based technology

The PSC charge controller series are the ideal choice for charging and protecting your batteries using state-of-the-art technology. All switching thresholds have been carefully chosen to suit most battery types and they are controlled by a microprocessor. Automatic load disconnection/reconnection upon over-voltage/deep discharge state is another useful feature, just as the temperature-compensated charging. All PSC units are equipped with automatic 12/24V system voltage detection.

Widespread use

The PSC charge controller uses PWM (Pulse Width Modulation) *series* regulation, e.g. the charging limit is regulated by modulating the charging current coming from the solar module. Therefore other charger types (such as standard power supplies, etc.) can also be connected additionally to the PV input terminal, not only solar cells.

PSCD series

For those who prefer to be familiar with their system parameters, Panelectron offers additional LCD display. Information can be read out on actual / min. / max. system voltage and current, as well as temperature. The RS232 communication port enables users to monitor their solar charge controller directly from their PC.

Specifications

Nominal voltage:	12 / 24 V
Solar module current:	10 / 20 / 30 A (according to each model)
Load current:	10 / 20 / 30 A (according to each model)
Max. current consumption:	10 mA
- Charging limit, float charge at 25°C:	13,8 V / 27,6 V
- Charging limit, Gas control at 25°C:	14,4 V / 28,8 V
- Gas control activation:	12,3 V / 24,6 V
- Temperature-compensation:	-4 mV/K/Cell
Deep discharge disconnection:	
- Constant:	10,5 V / 21,0 V
- Reset voltage:	12,0 V / 24,0 V
Fuse:	10 / 20 / 30 A (according to each model)
Temperature range:	-25° C ... +40° C
Optional:	
Port:	RS232 Pin 2=TXD 3=RXD 5=GND
LCD display:	1x16 digit, alphanumeric
- Voltage range:	8,00V ... 32,00V +/- 2Digit +/-2% from max. value
- Current range:	- 30,0A ...+ 30,0A +/- 2Digit +/-5% from max. value
- Temperature range:	- 40 °C ...+ 50°C +/- 2Digit +/- 5% from max. value
Dimensions (L×W×H):	190×120×53mm
Weight (without LCD / with LCD):	0,45kg / 0,5kg

Part no:	PSC-10	PSC-20	PSC-30	PSCD-10	PSCD-20	PSCD-30

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MPPT solar charge controllers

- MPPT (Max Power Point Tracking) charging algorithm
- Automatic system voltage recognition 12/24V
- Wide solar input voltage range from 5…25V (MPPT3) or 5…70V (MPPT10-20-30)
- Secondary battery charging options (only for MPPT3)
- Battery deep-discharge protection, over-charge protection, over-voltage protection
- Desulphating mode (battery conditioning)
- Temperature dependent charge parameter correction
- Over-temperature protection, over-current protection, fully electronic reverse-polarity protection
- DC load output with automatic/manual load-disconnection
- Option: Logging possibility on SD memory card
- Option: Remote control with display

What is MPPT?

The Maximum Power Point Tracking is a charging algorithm which enables a microprocessor-based solar regulator to take the maximum energy out of a solar panel and put it into the battery with very little loss. Most modern MPPT's are around 92-97% efficient in the conversion. You typically get a 20 to 45% power gain in winter and 10-15% in summer.

Desulphating mode

90% of the battery faults are owed to the lead-sulphate layer on the battery plates set over the years preventing proper electron transfer between the plates and the electrolyte. The MPPT solar regulator uses a well-known charging technique which is called "impulse-charging". The desulphating impulses (100 μs – 60V spikes) come in every 3 second period only when the DC load is inactive. Thanks to this charging method the existing lead-sulphate layer will be removed from the battery plates of your valuable solar batteries, the charging impulses also prevent new sulphate formation in the future. In addition to a guaranty of maximum capacity, this also means extremely long durability and lifetime of your batteries, ensures the protection of the environment and your wallet.

Standby-operation

In order to be more efficient and energy-saving, the MPPT solar regulator goes into sleep mode if the solar module does not provide at least that much energy which is required for the operation of the solar charger itself. This means that in cloudy weather or at night, when the operation of the solar regulator would be supplied only from the battery, there will be no unnecessary power consumption.

Specifications

Model	MPPT3	MPPT10 / 20 / 30
Battery voltage	12 / 24 V (automatic)	12 / 24 V (automatic)
PV module voltage range	5 … 25V	5 … 70V
Max. module current (Usolar > Ubatt):	3 A	10 / 20 / 30 A
Max. module current (Usolar < Ubatt):	3A	3A
Max. load	3 A	10 / 20 / 30 A
Typ. consumption in active status	60-70 mA	100-110 mA
Typ. consumption in standby status	< 1 mA	< 1 mA
Optional remote control panel with LCD	YES	YES
Optional logging possibility on SD memory card	YES	YES
Secondary battery charging	YES	NO
External temperature probe	YES	YES
Dimensions (L × W × H)	125 x 80 x 42 mm	190 x 112 x 59 mm
Weight approx.	330 g	780 / 870 / 890 g

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PWR-60 wind charge controller

- PWM regulated charging
- 60A charging current
- Selectable 12 – 24 – 48V battery charging options
- LCD indication for system voltage and current
- 3 × 120VAC typical generator voltage (other voltages upon request)
- Convection cooled heat sinks

Description

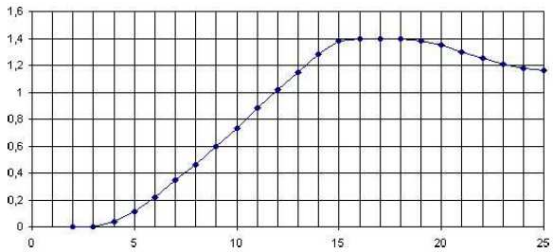
The PWR-60 wind charge controller is suitable for wind turbines with brushless permanent magnet generators or hydro systems with brushless permanent magnet generators, which has a 3-phase AC output within the corresponding voltage range. It rectifies and regulates the generator's 3-phase alternating current in order to be able to charge 12 – 24 – 48 V battery banks in a smooth and safe way. The PWR-60 also protects the batteries from over-charging through its dumpload techniques. The main switch short-circuits the 3 phase of the generator when in OFF position (break switch).

Dumpload

When the battery has reached a fully charged state, the excess current from the generator is transferred to a dumpload heat element via solid state MOSFETs. The filament of dumpload is made of NiCr material, which prevents the humming noise during operation, which is a typical characteristic of ferrite-based heating elements.

Protections

A blocking diode protects the batteries from alternating DC currents, which has a lifetime decreasing effect on the batteries. A capacitor permits the disconnection of the battery terminals in all circumstances.



Typical turbine (1400W) output: kW per m/s

Specifications

Nominal battery charging voltage:	12 / 24 / 48V - switch-selectable, switch located beneath cover
Minimum battery charging voltage:	9 / 18 / 36V
Typical generator voltage:	3 × 120VAC unloaded (other rating upon request)
Maximum charging current:	60A @ all voltages (higher rating upon request)
Max. generator current:	max. 50A / phase
Regulator's cut-off voltage at 25°C:	14,1 / 28,2 / 56,4V
Max. open circuit voltage:	60-80V
Max. short circuit current:	200A
Max. current consumption:	3mA
Switching frequency:	ca. 1 kHz
Operating temperature:	-20 … +50 °C
Cooling:	Convection-cooled (no fan)
Enclosure:	Metal housing with paint finish
Screw terminals:	16 mm^2 - reachable from outside
Dimensions (H×W×L):	120 × 450 × 325 mm
Weight:	6 kg
Voltage and Current meters	
- Measuring voltage:	10 … 60V
- Voltage resolution range:	0,1 V
- Measuring current:	0 … 60A
- Current resolution range:	100mA
Suggested dumpload:	DL-24 (24V – 60A; NiCr 80 in aluminium touch-free cage)

Subject to alteration without notice

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PC5 - PC10 - PC20 switchmode power converters

- 24 VDC to 12 VDC
- 5 – 10 – 20A output current
- Over-voltage protection
- Reversed-polarity protection
- Overload-protection
- Protection against idling

Description

This switchmode power converter is built without galvanic isolation between the input and the output. Due to its 50 kHz switching frequency, the internal components are small in size. Furthermore, with its 85% efficiency, low heat emission and small mechanical dimensions these units stand out among other conventional converters.

The power converter is protected against short-circuit, reversed-polarity, overloading and idling.

Application area

This power converter can be applied wherever the 24 V DC power needs to be converted into 12 V DC power, such as industrial, automotive, solar and marine application.

Specifications

Type	PC5	PC10	PC20
	24 / 12V, 5A DC	24 / 12V, 10A DC	24 / 12V, 20A DC
Input voltage:	18 - 32V DC	18 - 32V DC	18 – 32V DC
Output voltage:	13,8 V ± 3%		
Output current:	5A	10A	20A
Efficiency:	85%		
Short circuit current:	6A max.	12A max.	22A max.
Spikes:	100 mV_{ss}		
Fuse:	5A	10A	20A
Conformal coating against humidity and vibration:	Optional	Standard	Optional
Weight:	approx. 240 g	approx. 300 g	approx. 400 g
Dimensions (L × W × H):	125 × 57 × 50 mm	125 × 59 × 50 mm	185 × 75 × 60 mm
Operating temperature:	- 20 °C … + 50 °C		
Storing temperature:	- 40 °C … + 70 °C		

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Battery activator

Why do batteries need to be replaced before their actual lifetime is over?
Because there are too much lead sulphate on the battery plates which prevents taking on and giving off energy when charging / discharging.

What happens if no desulphator device is used to reverse this natural process?
During the normal charging / discharging process, the sulphates travel back and forth in the electrolyte solution (which is the battery acid itself) between the positive and negative plates, taking on and giving off energy. With the time an increasing percentage of sulphates will remain on the battery plates, as their size grows bigger. These inactive sulphates reduce the efficiency of the battery, which dies eventually.

What happens if the battery activator is used on your batteries?
First, even used or dead batteries could continue working as there are enough active material in them. Their problem is the sulphate layer between the battery plates and the battery acid. The battery activator prevents the formation of this layer on new batteries and also dissolves the already formed sulphate layer from the surface of the plates and makes these sulphates active again in the electrolyte.

Application area
Passenger cars, Recreational vehicles, Commercial trucks and fleets, Boats, Agriculture, Buses, Emergency vehicles, Industrial, Motorbikes, Military, Police, Railroad, Photovoltaic installations, etc.

Advantages of using our circuit
- ✓ enables the battery to give out more power and doubles/triples its lifetime
- ✓ protects the environment by the reduced number of disposed batteries
- ✓ increases your battery's deep cycle capacity
- ✓ brings old or dead batteries back to life
- ✓ available in attractive packaging

Working principle
The battery activator reverses the natural electro-chemical reaction within the battery. The battery activator returns the absorbed energy (which is gained from the battery itself) into the battery in approx. every 5…20 sec. in form of high current spikes. Due to these short-time high-current pulses the lead sulphates then return to the battery acid as active electrolyte. The current consumption is 2–7 mA, which is only a decade of the self-discharge loss. It is recommended for conventional lead acid batteries of 12-24 V with capacity between 10Ah and 200Ah.

Technology
The circuit is manufactured on printed circuit board, with modern SMD technology, enclosed in fiberglass-based plastic housing. The unit is resistant to humidity and splashing water.

Installation
Connect the negative (black) and positive (red) wires permanently to the corresponding battery poles. Fix the circuit in place with the screw included in the package. The built-in LED serves for controlling the continuous work of the circuit.

Specifications

Model	**BA-12**	**BA-12-24**
Supply voltage range:	10 - 16 V	10 - 32 V
Battery type:	12V gel/sealed/flooded lead acid	12V or 24V gel/sealed/flooded lead
Charging current pulse:	80 - 100 A	80 - 200 A
Microprocessor-controlled:	NO	YES
Working current consumption:	2-5 mA	4-7 mA
Pulse repeating time:	5…20 sec.	
Working temperature range:	-25 C - +85 C	
Measurements:	23 × 30 × 30 mm	
Weight:	approx. 50 g	
EMC Directive (89/336/EEC)	EN50081-1:01.92; EN50082-1:01.92	

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DUAL 80 battery split charger

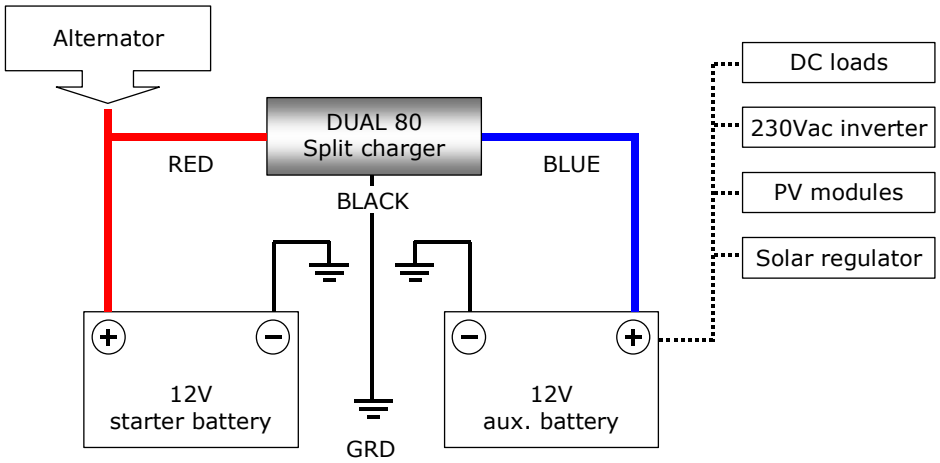
- Safely charges a secondary battery from engine start battery
- Diverts excess energy to auxiliary battery only when starter battery is fully charged
- Ideal for caravans, motor homes or boats
- Automatic sensing makes sure that the secondary battery is only charged when the alternator / external power supply is present and the primary battery is at fully charged state.

Why you need a split (or twin) battery charger?

In many applications there are several auxiliary 12Vdc loads (lights, water pumps, TV, fridge, navigation equipment, etc.) used onboard in vehicles such as caravans, motor homes, boats, etc. A twin battery charger is needed for such vehicle in order to avoid auxiliary loads draining the engine start battery. If the voltage of the starter battery drops below a certain level due to the excessive use, there won't be enough energy left in the battery to crank the engine. To avoid this, a secondary (auxiliary or twin) battery must be installed on board. As you must always give priority to the starter battery, the primary (for engine start) and secondary (for auxiliary loads) batteries can not be simply connected together since this could still result in a discharged starter battery. So you will need a dual battery charger which starts charging the auxiliary battery only when the main engine start battery is fully charged and there is enough excess energy from the alternator or external power supply.

Description

While the vehicle is on the way the alternator charges the engine start battery. When it is fully charged and the alternator puts the battery voltage above 13.6V, the DUAL 80 split charger connects the auxiliary battery also to the alternator. Now both batteries are being charged and remain parallel-connected until their voltage stays above 12.8V. When their voltage drops below 12.8V the DUAL 80 split charger disconnects the auxiliary battery from the alternator.



Battery

The DUAL 80 twin battery charger is suitable for automotive 12V lead-acid batteries up to the limit of 500 Ah.

Specifications

Battery voltage:	12Vdc
Nominal charging current:	80A
Max. battery voltage:	16V
Power consumption – aux. battery connected:	3.6W
Power consumption – aux. battery disconnected:	1.2W
Auxiliary battery connection voltage point:	13.6V
Auxiliary battery disconnection voltage point:	12.8V
LED display:	Aux. battery connected / disconnected
Dimension (W×H×L):	105×49×62 mm
Weight:	300 g

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Automatic battery charger

- Automatic charging current adjustment according to the discharged state of the battery
- Permanent 6A charging current (peak 8A)
- LED indication for “supply voltage” and “charge control”

The AUTOMATIC battery charger automatically charges 12V lead-acid batteries with a nominal capacity of about 35 to 70 Ah.

Description

The charging current depends on the discharge degree of the battery. The automatic charging control turns off the charging current at the cut-off voltage of approx. 14V and turns it on again when the battery voltage has dropped to about 12,8V, thus avoiding overcharging or gassing of the battery and compensating for spontaneous discharge. Moreover, this facilitates floating operation of the battery.

The red LED serves as supply voltage control, the green LED indicates that the charging procedure is running.

Specifications

Operating voltage:	230V AC
Mains frequency:	50 – 60Hz +10% / -15%
Primary fuse:	Fine-wire fuse 5*20mm, 250V, 630mA Surge-proof (charger backside)
Secondary fuse:	Fine-wire fuse 5*20mm, 250V, 6,3A Surge-proof
Power consumption:	Max. 102VA at 6A charging current 150VA at full-load operation
Charging voltage:	Approx. 13V (automatic turn-off in case of short-circuit)
Charging current:	Permanent 6A, max. 8A
Degree of protection:	Safety class II – degree of protection IP20
Weight:	2 kg
Dimensions:	(W×H×D) 120×80×170mm
Cut-off voltage:	13,8V (no overcharging)
Turn-on voltage:	12,8V (deep-discharged batteries can be charged from 10,5V) Min. battery voltage: 10,5V
Turn-off voltage:	14,5V
Display:	RED LED – supply voltage control GREEN LED – charge control
Standards:	EMC-tested, DIN VDE 0700 (EN 60335)

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Unilader battery charger

- Continuously adjustable charging current between 20mA … 1,4A
- Automatic battery voltage detection
- Fully automatic charging function for 2 / 6 / 12V Lead batteries with voltage selector switch
- LCD display for charging current indication
- LED indication for "battery full" and "charging battery"
- Short-circuit and reverse-polarity protected output

The UNILADER battery charger is a special equipment developed for the need of workshops, model-builders or special applications where an intelligent charger is required.

Description

The UNILADER is suitable for charging all types of NiCd, NiMH and Lead batteries between 1,2 … 12V DC. It detects the voltage of the connected battery and automatically adjusts its charging voltage accordingly. The charging current is continuously adjustable between 20mA and 1,4A. The actual charging current is shown on the LCD at the front side. Two LEDs indicate whether the battery is being charged (red LED lights) or it is fully charged (green LED lights). The output of UNILADER is short-circuit and reversed-polarity protected.

Fully automatic charging function

A fully automatic charging function is provided for 2 / 6 /12V lead batteries. The electronics take control over the whole charging process; only the appropriate battery voltage has to be selected. The battery is monitored constantly and it can remain connected to the charger over an unlimited time. Its charging state is kept at the most suitable voltage level by switching the charging off upon reaching the max. charging voltage and switching the charging back again upon reaching the min. charging voltage. This prevents dangerous gas formation and overcharging.

When charging NiCd and NiMH batteries, the automatic charge function must be switched off.

Specifications

Mains voltage:	230V AC +6% / -10%
Mains frequency:	50 – 60Hz
Nominal power:	max. 40VA
Mains fuse:	T315mA/250V
Nominal charging voltage range:	1,2 … 12V DC

Max. and min. charging voltage thresholds in automatic charging mode:

Max. charging voltage:	2,3 – 6,9 – 13,8V ±1,5%
Min. charging voltage:	2,1 – 6,3 – 12,8V ±2,5%

Charging current:	Continuously adjustable between 20mA … 1,4A
Charging current indication:	3,5 digit LCD display
Accuracy:	2%
Operating temperature range:	0 … +40 °C
Weight:	Approx. 1,5 kg
Dimensions (W × H × L):	110 × 70 × 155 mm
Low Voltage Directive (73/23/EEC)	EN60335-1 :09.94+A11 :05.95; EN60335-2-29 :02.91+A2 :04.93

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Universal battery charger

- Suitable for charging nickel-cadmium, nickel-metal-hydride, lead acid, lead gel, lead-fleece and lithium-ion rechargeable batteries
- Discharge function for NiCd/NiMH batteries
- Selectable charging voltage and current
- LED indication for "Discharging battery" "Charging battery", "Battery check" and "Battery fully charged"

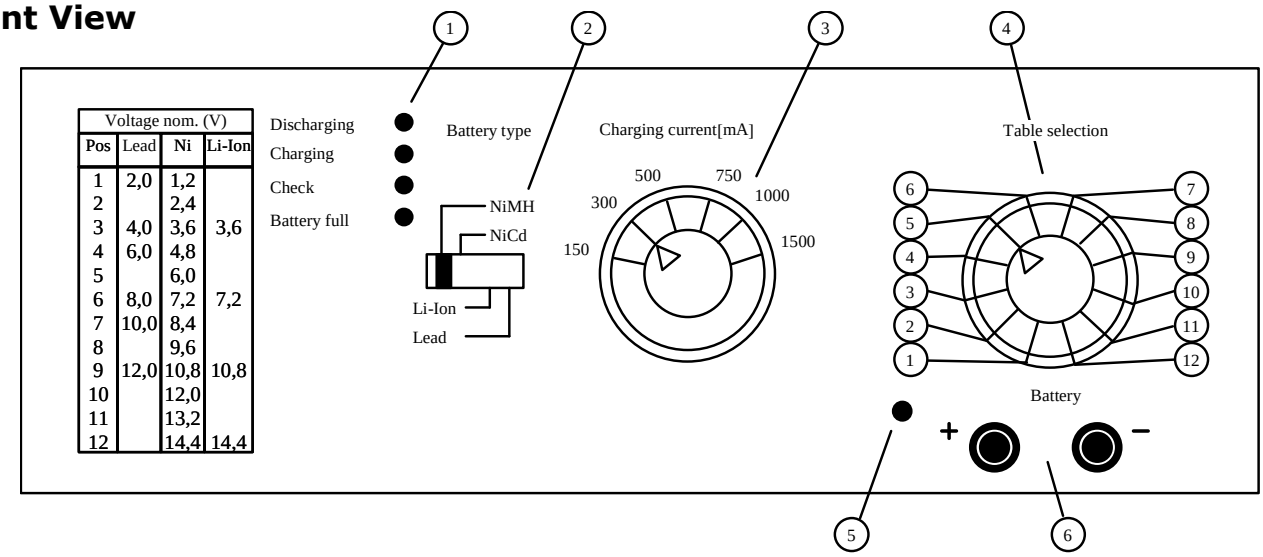
The Universal battery charger unit is a good choice for those who require a device opted for charging different battery types in the most optimal and smoothest way. Among its extensive adjustment possibilities you will certainly find the solution for your charging needs.

Operation

The Universal battery charger has the following features:

1. LED indicators provide information about the status: **Discharging**, **Charging**, **Check** (in the case of deep discharged or damaged batteries this LED lights) and **Battery full**.
2. Pre-selection switch for the battery type. The types nickel-cadmium, nickel-metal-hydride, lead acid, lead gel, lead-fleece and lithium-ion can be pre-selected.
3. Rotary selection switch for the charging current. The pre-selection is made depending on the battery size (mAh) or the manufacturer's specifications regarding the max. charging current.
4. Rotary selection switch for the number of cells. The pre-selection is made in accordance with the printed table, depending on the respective preselected battery type.
5. Button for the discharging function. If NiCd or NiMH has been preselected, a defined discharging of the battery up to 1 V per cell takes place after the button is pushed. Afterwards, the charging program starts automatically.
6. 4 mm lab sockets on the front side of the unit for the connection of the batteries

Front View



Function – Pre-selection switch battery type
The pre-selection of the battery type basically determines the characteristics of the battery charging behaviour. Thus, it is important to be mindful of the correct pre-selection.

Discharge Button (only possible with NiCd/NiMH pre-selection
In both settings, a defined discharging of the batteries prior to charging is possible in order to suppress possible memory effects, i.e. in the event of repeated partial discharges, the battery can only be discharged to the partial discharge limit again. For this purpose, the "Discharge" button must be pressed. The LED indicator „Discharging" indicates the discharging. The battery is now undergoing a defined discharging up to a cell voltage of 1 V/cell. Afterwards, the charging process starts automatically.

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Charging current pre-selection switch
There are six different currents available:

150 mA 300 mA 500 mA 750 mA 1000 mA 1500 mA

The charging current must be adjusted in accordance with the indicated Ah rating of the battery. It is important hereby to observe the specifications/instructions of the battery manufacturer. If the manufacturer regarding the maximum charging current provides no information, the lowest charging current should be selected when in doubt. Batteries below 150 mA C5 rating (C5 = capacity at 5 hours discharging) may only be charged when the battery manufacturer expressly permits this.

Rated voltage pre-selection Switch
The pre-selection switch for the rated battery voltage must be set according to the cell number or rated voltage of the battery before you connect the battery to the battery charger. The table printed on the front of the unit is to be used for selecting the correct switch position. The rated voltage per cell is 2,0 V for lead, 1,2V for NiCd/NiMH and 3,6 V for Li-Ion.

LED Indicators
Four LED indicators provide information on the status.

- **Discharging** indicates that the battery is being discharged through an internal load.
- **Charging** indicates that the battery is currently being charged.
- **Check** indicates that the battery is not yet in the appropriate voltage range to switch to the quick-charging procedure. The battery is being charged with approx. 15% of the selected charging current. If the battery is only deep-discharged, the device will return to the quick-charging mode after reaching the charging range. If the battery voltage does not increase, the charging current will be terminated after a maximum of I hour, since there is obviously a battery defect present.
- **Battery full** indicates that the battery is 100% charged. In the pre-selection position Battery Type Lead or Li-Ion, this indicator will also light up when no battery is connected.

Specifications

Input voltage:	230V AC ~ 50Hz
Input power:	Max. 30VA
Rated output voltage:	1,2 – 14,4 V
Rated output current:	Min. 150 mA / Max. 1500 mA
Charging output connections:	4 mm lab sockets
Battery type pre-selection:	NiCd / NiMH / Lead / Li-Ion batteries
Charging process:	
Lead / Li-Ion	Constant current charging with concluding full charging at the voltage limit
NiCd / NiMH	Constant current charging with concluding full charging at reduced current and U_{peak} capture
Selectable cell number:	
NiCd / NiMH batteries	1 - 12
Lead batteries	1 - 6
Li-Ion batteries	1 - 4
Selectable charging currents:	150 mA / 300 mA / 500 mA / 750 mA / 1000 mA / 1500 mA
LED status indicators:	Discharging / Charging / Check / Battery full
Protection class:	II
Protection type:	IP20
Operating temperature range:	0 °C to +40 °C
Dimensions (L × W × H):	210 × 225 × 72 mm
Weight:	0,8 kg
EMC Directive (89/336/EEC)	EN50082-1 :01.92; EN61000-3-3 :01.95; EN55011 :03.91; EN60555-2
Low Voltage Directive (73/23/EEC)	:04.87; EN61010-1 :04.93+A2 :07.95; EN61204 :01.95

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Panelectron

PROFI electronic lime scale inhibitor

This professional electronic descaler device provides an effective protection against scale deposits in water pipe systems and any equipment connected to such pipe systems.

- Working frequency up to 2 kHz
- Already existing lime deposits are slowly being dissolved and flushed away. The water quality is not affected by this process
- No intervention into the plumbing systems is necessary since the electromagnetic waves work from the outside on the calcium carbonate particles in the water
- Economically and environmentally beneficial process since no chemical substances of any kind are used

Description

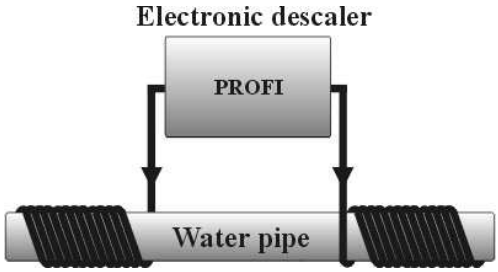
This scale inhibitor device is intended for use in small size households with a pipe diameter of max. 3/4" (3/4 inch = approx. 19 mm) and for water consumption of up to 5 m³/h. The basic structure of the lime is changed by the electromagnetic waves in such a way that no solid deposits have a chance to develop again. The professional electronic descaler device is appropriate for all degrees of water hardness and can be adjusted individually. As a result of lime-free heating elements, you will also be able to reduce the energy requirements and the amount of detergents and dishwashing agents used.

Installation

The electronic descaler device should be located near the main water pipe entering the house or building (fixture elements are provided). The unit operates on 9V DC voltage so a 230V AC power outlet should be available for the 9V DC power supply. The two wires (aerials) coming from the lime scale inhibitor are to be wound around the water pipe and fixed as shown in the picture.

There are three different features that can be adjusted according to the water hardness:

- Signal *frequency* position: 1.) 500Hz, 2.) 1000Hz, 3.) 2000Hz
- Signal *amplitude* position 1.) null amplitude, the unit is turned off, 2.) low amplitude, 3.) high amplitude
- Signal *rise time* position 1.) long rise time, 2.) medium rise time, 3.) short rise time



Hardness level 1
Positions: *frequency*: 1 *amplitude*: 2 *rise time*: 1

Hardness level 2
Positions: *frequency*: 2 *amplitude*: 3 *rise time*: 2

Hardness level 3 - 4
Positions: *frequency*: 3 *amplitude*: 3 *rise time*: 3

Hardness level	Water hardness dH	Description
1	Up to 7	Soft
2	7 – 14	Medium
3	14 – 21	Hard
4	More than 21	Very hard

Water hardness dH level can be obtained from your local water supply utility or determined by using appropriate testing strips in a well-stocked drugstore.

Specifications

Input voltage:	Power is supplied by means of a standard power supply unit with 9V output voltage and 3,5mm jack (not included)
Dimensions:	132 x 90 x 32 mm
Weight:	216 g
EMC Directive (89/336/EEC)	EN55014-1:1993+A1+A2; EN55014-2:1997; EN61000-3-2: 1995+A1+A2+A14; EN61000-3-3:1995

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MULTI electronic lime scale inhibitor

This professional electronic descaler device provides an effective protection against lime deposits in water pipe systems and any equipment connected to such pipe systems.

- Working frequency up to 5 kHz
- Already existing lime deposits are slowly being dissolved and flushed away. The water quality is not affected by this process
- No intervention into the plumbing systems is necessary since the electromagnetic waves work from the outside on the calcium carbonate particles in the water.
- Economically and environmentally beneficial process since no chemical substances of any kind are used

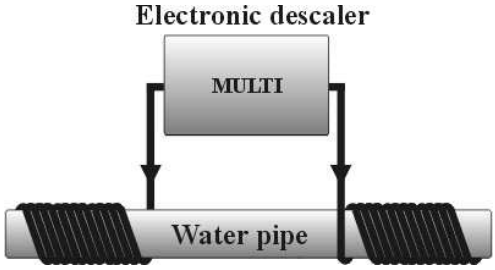
Description

This device is intended for use in small or medium size households with a pipe diameter of max. 1" (1 inch = approx. 25 mm) and for water consumption of up to 5 m³/h. The operation of the unit is controlled by a pre-programmed microprocessor. The function buttons are long-life foil keypads that enable easy selection of the operation modes. The basic structure of the lime scale is changed by the electromagnetic waves in such a way that no solid deposits have a chance to develop again. The professional scale inhibitor device is appropriate for all degrees of water hardness and can be adjusted individually. As a result of lime-free heating elements, you will also be able to reduce the energy requirements and the amount of detergents and dishwashing agents used.

Installation

The electronic descaler device should be located near the main water pipe entering the house or building.

Operating modes



There are five different modes that can be selected:

- "**1 kHz**" mode
- "**3 kHz**" mode
- "**5 kHz"** mode
- "**Pipe maintenance**" mode
- "**Automatic**" mode

1 kHz – 3 kHz – 5 kHz mode:
Selection: After switching the unit on (which runs a short self-test program first), it starts operating in the mode "1 kHz". By pressing the MODE button once the unit switches over to "3 kHz" mode, by pressing once more it switches over to "5 kHz" mode.

Pipe maintenance mode:
If your water pipe system has already heavy lime deposits, it is recommended to run the "pipe maintenance mode" for 4 weeks in order to dissolve the deposits faster. Afterwards the "Automatic" mode is to be selected.

Automatic mode:
The highest efficiency can be reached in this mode whilst all programs are run simultaneously.

Specifications

Operating voltage: 230 V AC, Power consumption: 1,2 W, Dimensions: 160 × 80 × 40 mm, Weight: 430 g.
EMC Directive (89/336/EEC): EN55014-1: 1993+A1+A2; EN55014-2: 1997; EN61000-3-2: 1995+A1+A2+A14; EN61000-3-3: 1995
Low Voltage Directive (73/23/EEC): EN60335-1 :1994+A1 :1996-tól A16 :2001-ig; EN60730-1 :2000

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MULTI PLUS electronic lime scale inhibitor

This professional electronic descaler device provides an effective protection against lime deposits in water pipe systems and any equipment connected to such pipe systems.

- Working frequency up to 25 kHz
- Already existing lime deposits are slowly being dissolved and flushed away. The water quality is not affected by this process
- No intervention into the plumbing systems is necessary since the electromagnetic waves work from the outside on the calcium carbonate particles in the water.
- Economically and environmentally beneficial process since no chemical substances of any kind are used

Description

This device is intended for use in medium or large households, block of flats, commercial establishments with a pipe diameter of max. 5/4" (5/4 inch = approx. 32 mm) for water consumption of up to 5 m³/h. The operation of the unit is controlled by a pre-programmed microprocessor. The basic structure of the lime scale is changed by the electromagnetic waves in such a way that no solid deposits have a chance to develop again. The professional scale inhibitor device is appropriate for all degrees of water hardness and can be adjusted individually. As a result of lime-free heating elements, you will also be able to reduce the energy requirements and the amount of detergents and dishwashing agents used.

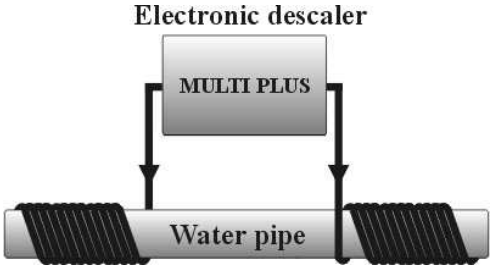
Installation

The electronic descaler device should be located near the main water pipe entering the house or building.

Operating modes

There are five different modes that can be selected:

- **"1 kHz"** mode
- "**3 kHz**" mode
- "**5 kHz"** mode
- "**Pipe maintenance**" mode
- "**Automatic**" mode



1 kHz – 3 kHz – 5 kHz mode:
Selection: After switching the unit on (which runs a short self-test program first), it starts operating in the mode "1 kHz". By pressing the MODE button once the unit switches over to "3 kHz" mode, by pressing once more it switches over to "5 kHz" mode.

Pipe maintenance mode:
If your water pipe system has already heavy lime deposits, it is recommended to run the "pipe maintenance mode" for 4 weeks in order to dissolve the deposits faster. Afterwards the "Automatic" mode is to be selected.

Automatic mode:
The highest efficiency can be reached in this mode whilst all programs are run simultaneously.

Frequency multiplier selector switch

In case the water flow, pipe diameter or existing scale deposits are higher than average, select this mode which multiplies the frequency by 5, rendering therefore a frequency output of 5 kHz instead of 1 kHz, 15 kHz instead of 3 kHz and 25 kHz instead of 5 kHz. In this mode individual frequencies or modes (such as Automatic or Pipe maintenance) can still be selected, the difference is that the outputted frequency will be five-times higher than the selected one.

Specifications

Operating voltage: 230 V AC, Power consumption: 1,2 W, Dimensions: 160 × 120 × 78 mm, Weight: 505 g.
EMC Directive (89/336/EEC): EN55014-1: 1993+A1+A2; EN55014-2: 1997; EN61000-3-2: 1995+A1+A2+A14; EN61000-3-3: 1995
Low Voltage Directive (73/23/EEC): EN60335-1 :1994+A1 :1996-tól A16 :2001-ig; EN60730-1 :2000

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Panelectron

PPS regulated laboratory power supplies

Panelectron's regulated laboratory power supply PPS series can provide reliable, cost-efficient solution for your power needs. We continuously follow the everyday need of the power supply market with our development and manufacturing works. Thus we know that large-scale orders are usually not placed through a catalogue or based on datasheets. What we can promise is that we always take your ideas seriously.

STANDARD PRODUCTS FEATURE

- Adjustable Constant Voltage (CV) or Constant Current (CC) mode with automatic crossover and mode indication
- Electronic short-circuit, overload and reverse-polarity (e.g. battery charging) protection

ADDITIONAL FEAUTURES TO OFFER

- Logic output of 5 V DC
- RS232 Communication Interface
- Built-in memory

SPECIFICATIONS

MODEL	U_{out} (V)	I_{out} (A)	DISPLAY
DC SINGLE			
18141	0 … 30V	0.01 … 1.2A	1 × pointer
18142	0 … 30V	0.02 … 2.5A	2 × pointer
18135	0 … 30V	0.02 … 2.5A	2 × LCD
18143	0 … 40V	0.05 … 5A	2 × pointer
18144	0 … 40V	0.05 … 5A	2 × LCD
DC DUAL			
18145	2 × 0 … 30V	0.02 … 2.5A	4 × pointer
18146	2 × 0 … 40V	0.02 … 2.5A	4 × pointer
18212	2 × 0 … 40V	0.05 … 5A	4 × LCD
DC TRIPLE			
18148	2 × 0 … 30V 5 V aux.	0.02 … 2.5A 2 A max.	4 × LCD
18158	2 × 0 … 30V 5 V aux.	0.02 … 2.5A 2 A max.	4 × pointer
AC & DC			
18210	0 … 25 Vdc 5 V DC aux. 0 … 25 Vac	0.05 … 5A 2 A max. 5 A max.	2 × pointer
18216	0 … 48 Vac 0 … 230 Vac	0.02 … 2A 2 A max.	2 × pointer
SWITCHMODE			
18220	0 … 40V	0 … 5A	1 × LCD
18222	0 … 30V	0 … 10A	1 × LCD
18226	2 × 0 … 40V	0 … 5A	2 × LCD
18228	2 × 0 … 30V	0 … 10A	2 × LCD
CUSTOM – DESIGNED			
18232 / A	12 / 13.8V	25 A max.	1 × LCD
18232 / B	12 / 13.8 / 15V	25 A max.	1 × LCD

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MODEL	18141	18142	18135	18143	18144	18145	18146	18212	18148	18158	18210	18216
MAIN OUTPUT(S)	**DC SINGLE**					**DC DUAL**			**DC TRIPLE**		**AC & DC**	
DC output voltage range (V)	0…30V			0…40V		2×0…30V	2×0…40V		2×0…30V		0…25V	0…48V
DC output current range (A)	0.02…1.2 A	0.02…2.5A		0.05…5A		2×0.02…2.5A		2×0.05… 5A	2×0.02…2.5A		0.05…5A	0.05…2A
Meter type (pointer or 3.5-digit LCD)	1 × pointer	2 × pointer	2 × LCD	2 × pointer	2 × LCD	4 × pointer		4 × LCD		4 × pointer	2 × pointer	
AC output voltage range	–										0 … 25V	0 … 230V
AC output current (max.)	–										5A	0.2A
Logic output voltage (fixed)	–								5V			–
Logic output current (max.)	–								2A			–
Line regulation for ±10% line voltage change in Constant Voltage mode	≤0.05%											
Line regulation for ±10% line voltage change in Constant Current mode	≤0.05%	≤0.02%		≤0.05%								
Load regulation for ±100% load change in Constant Voltage mode	≤30 mV											
Load regulation for ±100% load change in Constant Current mode	≤5 mA	≤25 mA		≤10 mA		≤1 mA		≤10 mA	≤1 mA		≤10 mA	
Ripple and noise (at max. load)	≤1 mV rms											
GENERAL												
Input voltage	230 VAC ±10%											
Input frequency	50/60 Hz											
Consumption (at full load)	70 W	120 W		280 W		240 W	280 W	550 W	260 W		400 W	200 W
Dimensions (mm)	144×120 ×260		150×110 ×280	260×140 ×200		260×140 ×260		300×300 ×140	260×140 ×260		285×145 ×245	380×130 ×190
Weight (kg)	2.5kg	4,5kg		7kg		7.5kg		12kg	7.5kg		9.4kg	8kg
Operating temperature	+5 ... +40ºC											
Storing temperature	-25 --- +55ºC											
Relative humidity for operation	max. 85%											
RS232 communication	N/A											

MODEL	18218	18220	18222	18226	18228	18232 A	18232 B
MAIN OUTPUT(S)	**SWITCHMODE**					**CUSTOM - DESIGNED**	
DC output voltage range (V)	0…30V	0…40V	0…30V	2×0…40V	2×0…30V	12-13.8V fixed positions	12-13.8-15V fixed positions
Adjustment steps (approx. value)	33 mV	50 mV	33 mV	50 mV	33 mV	–	
DC output current range (A)	0…2.5A	0…5A	0…10A	2×0…5A	2×0…10A	25A max.	
Adjustment steps (approximate value)	50 mA	100 mA	200 mA	100 mA	200 mA	–	
Meter type (3.5-digit LCD)	1 × LCD			2 × LCD		1 × LCD	
AC output voltage range	–						
AC output current (max.)	–						
Logic output voltage (fixed)	–						
Logic output current (max.)	–						
Line regulation for ±10% line voltage change in Constant Voltage mode	≤10 mV					–	
Line regulation for ±10% line voltage change in Constant Current mode	≤10 mA		≤50 mA	≤20 mA	≤50 mA	–	
Load regulation for ±100% load change in Constant Voltage mode	≤10 mV		≤20 mV	≤10 mV	≤20 mV	–	
Load regulation for ±100% load change in Constant Current mode	≤20 mA		≤100 mA	≤50 mA	≤100 mA	–	
GENERAL							
Input voltage	230 VAC ±10%						
Input frequency	50/60 Hz						
Built-in fuse	1,6A/250V "T"	2A/250V "T"	3.15A/250V "T"	4A/250V "T"	6.3A/250V "T"	4A/250V "T"	
Consumption (at full load)	<200 VA	<400 VA	<600 VA	<800 VA	<1200 VA	<600 VA	
Dimensions (mm)	100×100 ×280	100×170 ×280	100×180 ×280	100×340 ×280	100×360 ×280	105×180 ×220	
Weight (kg)	2kg	2.75kg	3kg	5.5kg	6kg	2.5kg	
Operating temperature	0 ... +40ºC						
Storing temperature	-25 … +55ºC						
Relative humidity for operation	max. 85%						
RS232 communication	YES					N/A	

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