

emponi

SOL-1 (MPPT) series Instruction manual

Maximum Power Point Tracking Solar Battery Charger for lead acid batteries 12V/24V

Relevant models: SOL-1, SOL-1(A)

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Thank you very much for buying this SOL-1 unit and congratulations for choosing this high tech high performing MPPT solar battery charger. The SOL-1 has been carefully designed and tested under harsh real environmental conditions for many years. Reliability, ruggedness, performance and the improvement of efficiency of solar systems have been key objectives in the development of the compact and versatile SOL-1 solar charger family series. The mechanical and electrical installation of the SOL-1 is user friendly: A flanged housing and the built-in polarity tester ease the installation. We hope you'll be able to use your SOL-1 for many years in the most satisfactory manner.



- Standard 12V Solar panel input → 12V or 24V battery charge (auto detected)
- Suitable for lead-acid batteries of wet cell or gel technology
- Maximum Power Point Tracking for up to 40% better use of the solar panel
- For up to 100W solar panel rating, max 6A charging current
- Power booster output for power range extension (in conjunction with SOL-PWR-x)
- Built-in battery and solar panel polarity tester
- Microprocessor controlled MPPT, SMPS and PWM technology.
- Serial interface output for performance analysis (in conjunction with SOL-LCD-1)

1. SAFETY ADVISE

- 1.1) Avoid short circuits and wrong connections to the SOL-1: Danger of fire !
- 1.2) Avoid reverse polarity of the solar panel and of the battery ! (Use built-in polarity tester ! maximum test time: 5sec). Keep batteries in a well ventilated area !
- 1.3) Do not exceed the max. operating conditions ! (details in chapter “Technical data”)
- 1.4) Add a suitable fuse into the (+) cable to the battery and load output (for 24V systems only). (details in chapter “Technical data”) !
- 1.5) Sparks / arc-overs can occur during installation and any time cables get in touch with terminals. Do not install this solar equipment in rooms where potentially flammable gases mixtures could be set free (e. g. by gas bottles, laquers, solvents, etc.)!
- 1.6) The case of SOL-1 must be mounted horizontally ensuring free access to the ventilation slots of the housing and in climatic suitable conditions ! (details in chapter “Technical data”)
- 1.7) The cable connected to the terminals must be of a suitable diameter and must not exceed a certain length ! (details in chapter “Technical data”)
- 1.8) Follow strictly the mechanical / electrical installation guide to avoid any malfunction or wrong commissioning of the SOL-1 !
- 1.9) Do not charge non-rechargeable batteries !
- 1.10) Keep electrically conducting material like metals etc. away from the terminal blocks top and bottom side. Danger of short circuit !

2. INSTALLATION GUIDE

2.1) Mechanical installation: The case of the SOL-1 has a flanged bottom side cover which should be used to mount the device on a wall or any other non-vibrating surface. Simple screws (not contained in the SOL-1 package) and washers can be used to attach the flanges to the (wall) surface. Mount the case horizontally ensuring free air ventilation around the housing.

2.2) Electrical installation: The SOL-1 has got a built-in polarity tester to simplify the installation of the system and to avoid a hazardous reverse polarity situation which might damage the SOL-1.

2.2.1) Usage of the polarity tester:

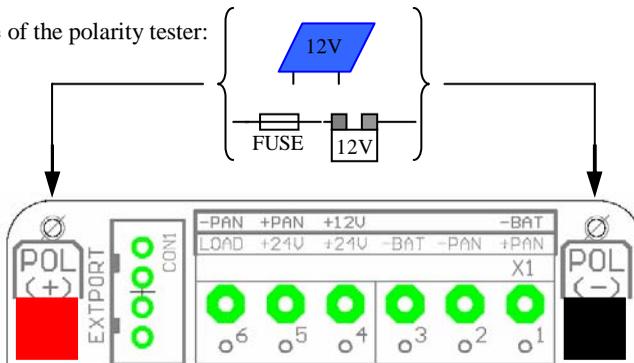
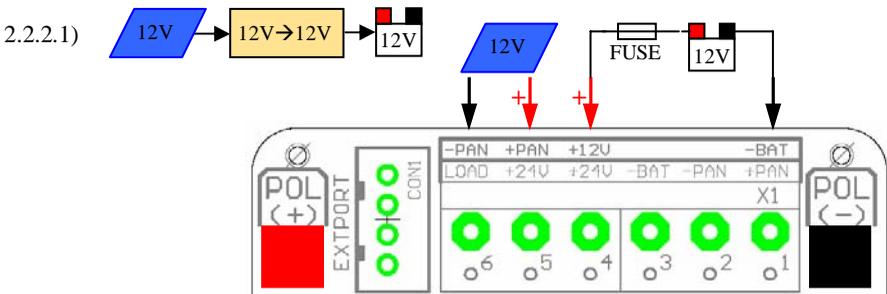
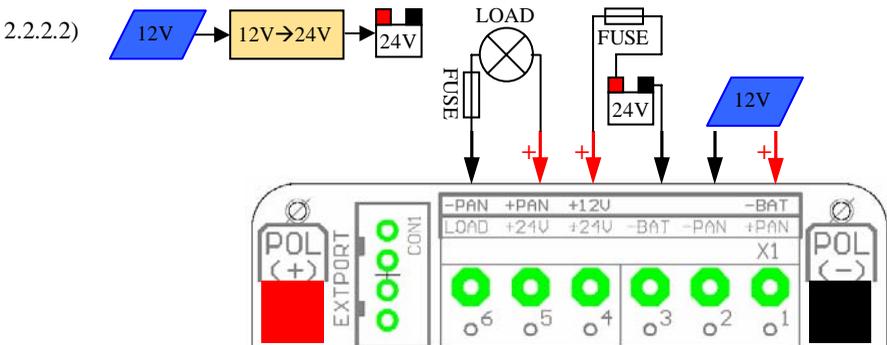


Figure 2.2.1 shows the usage of the polarity tester: For a maximum time of 5 seconds the cables of unknown polarity and maximum voltage of 24V (minimum voltage = 12V) are brought into contact with the square shaped metallized part of the PCB below the indication “POL(+)” and “POL(-)” respectively. If the built-in LED of the SOL-1 is getting on, the polarity of the cables touching the metallized pads will be polarized according to the indication on the PCB. If the LED is not on, please swap the cables. In case there is no LED indication in both ways, please check the cabling / fuse / battery voltage. This polarity test is only effective when the SOL-1 has not yet started to operate, e.g. before complete initialisation of the unit.

2.2.2) The connection of the battery, solar panel and the load (only applicable in 24V battery systems) to the terminals of the SOL-1 has to be done following a correct order. First the system must be determined as the SOL-1 is suitable charge 12V or 24V batteries out of a 12V solar panel in two different configurations. Depending on the used battery type two different wiring possibilities are existing. The corresponding connections to the SOL-1 for both types of battery voltage systems are indicated on the printed circuit board close to the terminal block. The following figures explain the 12V / 24V battery options of the connections:

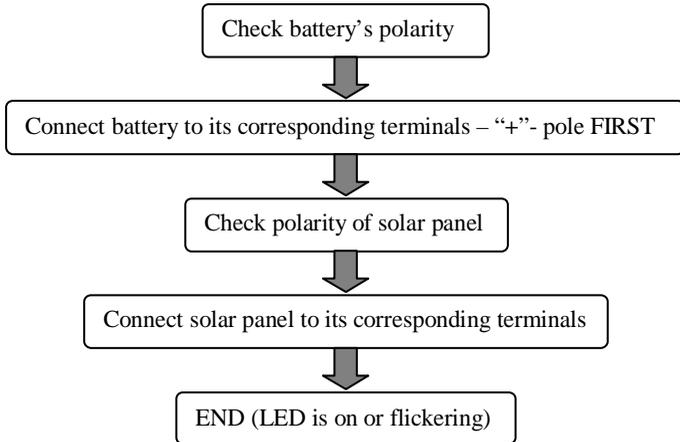


Connection diagram 2.2.2.1 indicates the configuration for a 12V battery system. The solar panel is a “12V” type.



The connection diagram 2.2.2.2 indicates the configuration for a 24V battery system. In this configuration a 24V rated non capacitive and non inductive load of up to 100W can be connected between the “LOAD” output and the +24V terminal. A suitable fuse must be implemented into this loop close to the output terminals of the SOL-1 to protect the output.

2.2.3) Electrical commissioning order



The correct initialization of the SOL-1 is confirmed by a lit LED or a flickering LED provided that the solar panel is sufficiently exposed to sun. Otherwise the commissioning has failed and the SOL-1 must be decommissioned and re-commissioned again.

2.2.4) Electrical decommissioning order

- The decommissioning order:
- 1.) Remove the solar panel
 - 2.) Remove the “-“ pole from the battery
 - 3.) Remove the “+”- pole from the battery.

3. LED FUNCTIONS

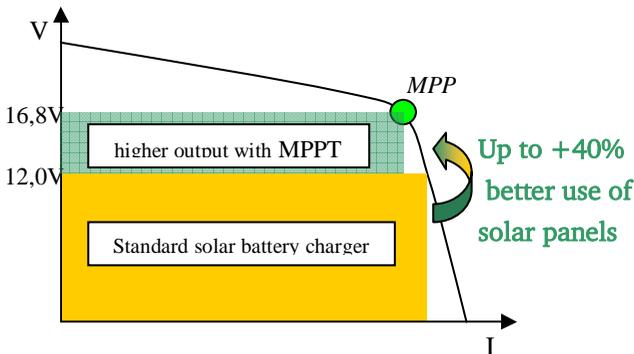
MODE	LED	INTERPRETATION
Polarity test	ON	correct polarity
Operation	OFF	Solar panel low (low sunlight)
	FLICKERING:	MPPT operating
	ON	battery full

Table 1 indicates the LED and its information content during the two modes “polarity test” during the commissioning of the SOL-1 and the “normal operation”.

4. MPPT (Maximum Power Point Tracking) function

The SOL-1 series contains a Maximum Power Point tracking software algorithm which efficiently optimizes the operation point of the solar panel. Through the MPPT functionality the solar system can reach up to 40% more output of the solar panel compared with standard solar battery chargers.

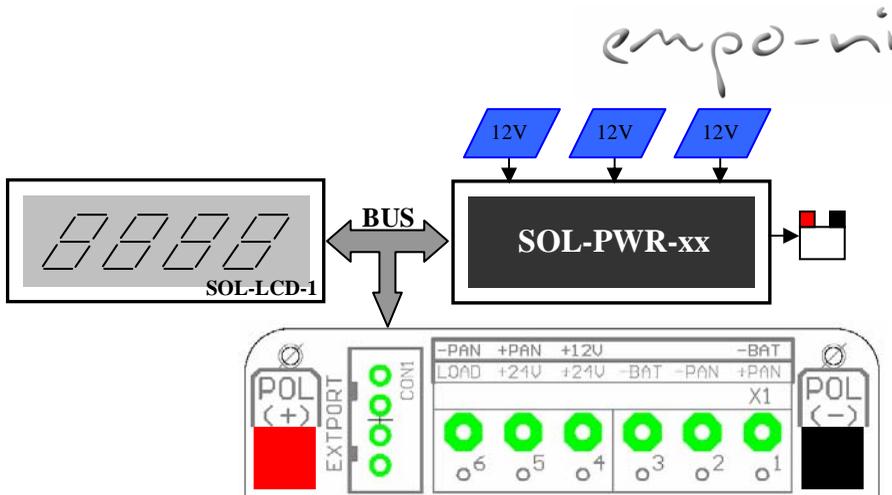
The decoupling of the best operation point for the solar panel (MPP) from the actual battery voltage by Switch Mode Power Supply (SMPS) technology and state-of-the-art microprocessor technology for efficient MPPT are the main features of the SOL-1 solar battery charger systems. The typical, highly temperature depending MPP voltage of solar panels is around 16,8V at 25°C and 1000^W/_m² of solar irradiation intensity under reference conditions. Assuming an empty battery at 12V the difference in the achievable performance between conventional and the SOL-1's MPP technology becomes apparent by the following graph showing an example curve of a V/I characteristic of a solar panel charging an empty battery:



A simple calculation on this example curve reveals the advantage of the SOL-1's MPP tracking function, which can reach up to 40% more output power than conventional systems. Smaller and much more cost efficient solar panels can be used to reach the same performance like conventional standard battery charger plus large solar panels.

5. EXTENSION PORT functions

The extension port "EXTPORT" and its 4 pins counting connector allows to connect accessories like a LC-Display unit (e.g. "SOL-LCD-1", ask your dealer) monitoring the performance of the power conversion (solar panel voltage, battery voltage, transferred solar power, battery condition) or a power multiplier (e.g. "SOL-PWR-xx") unit in case the SOL-1's output power is not sufficient. The information at this port is purely digitally coded, e.g. it requires a compatible receiving unit. Using a power multiplier unit the totally applicable solar panel's power (in Wp) is the sum of the SOL-1's own solar panel capability plus the power multiplier's capability. The same way of computation is valid to determine the maximum charging output current of the combined units.



The figure above indicates the principle of the bus system for information read-out and the usage of the power multiplication unit SOL-PWR-xx. SOL-LCD-1 and SOL-PWR-xx are accessories and are not contained in the SOL-1's scope of delivery.

6. TECHNICAL DATA

<i>ITEM</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Unit</i>
Operation temperature range	-20		45	°C
Storage temperature range	-40		85	°C
Solar panel voltage (open loop, entire temperature range)	12,0		24,0	V
Battery voltage	11,0		28,0	V
Solar panel rated power	15		100	W _p
Charging current	0		6,0	A
Own consumption (indicator = off)		3	12	mA
Battery end of charge protection voltage (24V system)	26,3	27,0	28,0	V
Battery end of charge protection voltage (12V system)	13,0	13,5	13,9	V
MPP voltage control range	12,0		19,0	V
Power terminal cable diameter		1,5		mm ²
Cable length (power / EXTPORT)			2,5	m
Humidity (non condensing)	20		60	rel%
Polarity tester usage time			5	sec
Fuse rating for battery and load output (fast time lag)		7,5	8,0	A
Capacity of charged battery	20			Ah
LOAD terminal output power (24V configuration only)			100	W
Weight		300		g

Classification according to EN60529: IP20, 2002/95/EC directive: RoHS compliant, 2002/96/EC ANNEX II (WEEE) directive: Electronic waste - do not dispose to unsorted municipal waste, dispose only at dedicated recycling /disposal centres for electronic waste !