

# VOTRONIC

## Installation and Operating Manual

<b>Solar Controller SR 130 Duo Digital</b>	<b>No. 3050</b>
<b>Solar Controller SR 200 Duo Digital</b>	<b>No. 3052</b>
<b>Solar Controller SR 300 Duo Digital</b>	<b>No. 3054</b>
<b>Solar Controller SR 400 Duo Digital</b>	<b>No. 3056</b>
<b>Solar Controller SR 500 Duo Digital</b>	<b>No. 3058</b>



Please read the operating manual thoroughly prior to use, connection and start-up of the solar controller.

For campers, caravans and boats.

The solar controller is a special development for use in campers, caravans and boats, and it is suitable for all types and makes of lead batteries (also for acid, GEL/dryfit batteries, as well as AGM/fleece batteries). Optimum charging is ensured by an intelligent microprocessor control with characteristic lines IUoU.

Working fully automatically and maintenance-free, the solar controller offers the following functions:

### Battery Ports and Charging Programs:

Charging port **main battery I**, depending on the type of battery, 3 charging programs selectable (see table 1):

- „AGM“: Closed, gas-tight AGM/fleece batteries (absorbed glass mat, lead-fleece technology)
- „Gel“: Closed, gas-tight Gel/dryfit batteries (determined electrolyte)
- „Lead Acid“: Closed and open acid/lead-acid batteries, as well as AGM with indication 14.4 V

### Charging Port Starter Battery II:

Separate auxiliary charging port (12 V (0.8 A) / 1.5 A) for support charging and trickle charge of the vehicle's starter battery with overcharge protection in case of extended stop periods.

### Further Characteristics of the Unit:

- The **charging voltage** being **free from peaks** is **controlled** in such a way, that any **overcharging** of the batteries is **excluded**.
- Two Battery Charging Ports:** Automatic charging of the main battery or board battery (Board I): Support charging and trickle charge of the vehicle's starter battery (Start II) with overcharge protection.
- Unattended Charging:** Standard protection against back discharge of battery (in case of insufficient solar power (such as at twilight, at night etc.), against overload and overheating.
- Floating Operation:** Observation of the characteristic lines of charging, even with simultaneous operation of consumers being connected to the battery.
- Overcharge protection:** Reduction of the charging current of the battery in case of excessive solar power and full battery. Immediate recharging in case of power consumption to ensure always the best possible charging state of the battery.
- Characteristic Line of Charging „I U1 U2“:** A defined charging boost (U1) avoids harmful acid accumulation and provides compensation charge to the individual battery cells. After that, automatic trickle charge (U2).
- On-board Mains Suppression Filter:** Integrated on-board mains suppression filter ensures unproblematic parallel operation of the controller with other charging sources, wind- and petrol-driven generators, mains supply chargers, dynamos etc. at one battery.
- Connection for Temperature Sensor** (Order No. 2001): Automatic adaptation of the charging voltage to the **battery temperature**. In case of **low outside temperatures**, **full charging** of the weaker battery is **improved**, and in case of summery temperatures **unnecessary battery gassing** will be avoided.  
**This is highly recommended, if the battery is exposed to strong variations in temperature, such as in the motor compartment.**
- Ready for Connection** to the **Votronic LCD Solar Display** (Order No. 1216), as well as to the **Votronic LCD Solar Monitor** (Order No. 1221) for optimum supervision of the solar system.
- Charging Cable Compensation:** Automatic compensation of voltage loss on the charging cables.
- Measurement Output for EBL (Electroblock of the Vehicle):** Allows convenient application of the solar (current display) being installed in the electroblock for supervision of the solar system.
- Terminal „AES“ (only SR 300 Duo Dig., SR 400 Duo Dig. and SR 500 Duo Dig.):** Automatic commutation of ELECTROLUX / DOMETIC refrigerators with “AES” (Automatic Energy Selector) from gas operation to 12 V-operation in case of excess solar power.



**Open acid batteries and batteries being „maintenance-free according to EN / DIN“:  
Check the acid level periodically!**



**Recharge totally discharged batteries immediately!  
Store only fully charged batteries and recharge them periodically!**



### **Safety Regulations and Appropriate Application:**

The solar controller has been designed according to the valid safety regulations.

**Appropriate application is restricted to:**

1. **Charging of lead-gel, lead-AGM or lead-acid batteries of the indicated nominal voltage and the simultaneous supply of the consumers being connected to these batteries in fixed installed systems.**
  2. **With solar panels up to maximum capacity (Wp).**
  3. **The indicated cable cross sections at the charging ports and at the panel input.**
  4. **With fuses of the indicated capacity near the battery to protect the cabling between battery and charging ports.**
  5. **Technically faultless condition.**
  6. **Installation in a well-ventilated room, protected from rain, humidity, dust, aggressive battery gas, as well as in an environment being free from condensation water.**
- **Never use the unit at locations where the risk of gas or dust explosion exists!**
  - Cables are always to be laid in such a way that damage is excluded. Observe to fasten them tightly.
  - **The connection cables have always to be led from below to the solar controller to ensure that penetrating humidity cannot reach the controller in case of failure, which will result in destruction of the controller.**
  - Never lay 12 V (24 V) cables and 230 V mains supply cables into the same cable conduit (empty conduit).
  - Check live cables or leads periodically for insulation faults, points of break or loosened connections. Occurring defects must be remedied immediately.
  - The unit is to be disconnected from any connection prior to execution of electrically welding or work on the electric system.
  - If the non-commercial end-user is not able to recognize the characteristic values being valid for a unit or the regulations to be observed, a specialist is always to be consulted.
  - The user/buyer is obliged to observe any construction and safety regulations.
  - **Except for the fuse, the unit is not equipped with parts, which can be replaced by the user.**
  - **Always use replacement car fuses of the indicated capacity!**
  - **Keep children away from the solar controller and the batteries.**
  - Observe the safety regulations of the battery manufacturer.
  - Deaerate the battery room. Protect the unit from aggressive battery gases.
  - Ensure **sufficient ventilation** of unit and panel!
  - Strictly observe the instructions of the manufacturer for installation of the solar panel.
  - Non-observance may result in injury or material damage.
  - The warranty period is 24 months from the purchase date (against presentation of the sales slip or invoice).
  - The warranty will be void in case of any inappropriate utilisation of the unit, if it is used beyond the technical specification, in case of improper operation or external intervention. We do not assume any liability for any damage resulting hereof. The liability exclusion is extended to any service being executed by third, which has not been ordered by us in writing. Service is to be effected exclusively by VOTRONIC, Lauterbach.

## **Installation:**

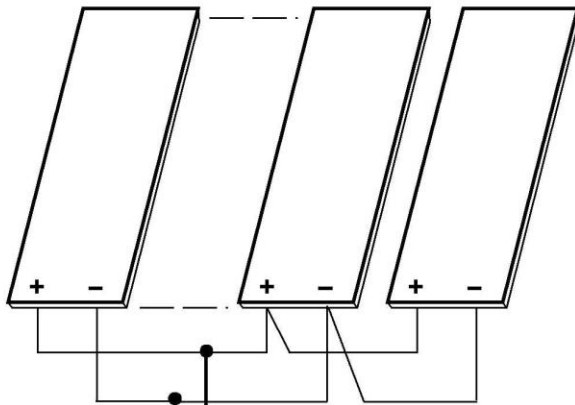
Install the solar controller on an even and **hard mounting surface** at locations **being protected from humidity and near the main/board battery (BOARD I)** to ensure that the **length of the battery's connection cable is as short as possible.**

We highly recommend an **installation position of the controller** in which the **terminals** for solar panel and batteries **point down**. This mode of installation improves cooling of the unit and **avoids that water runs along the connection cables** of the solar panel into the solar controller, even in case of damage!

The cable to the starter battery (terminal starter Batt. II) can be longer.

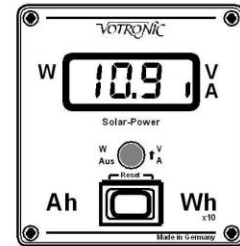
Despite the solar controller's high efficiency, heat is produced. Ensure sufficient **ventilation in the environment of the unit**, so that the heat can be carried-off. The unit might heat-up and thus should never be covered or "enclosed" to ensure full charging capacity. If possible, a **free space of 10 cm around it** should be ensured.

# Connection Plan:

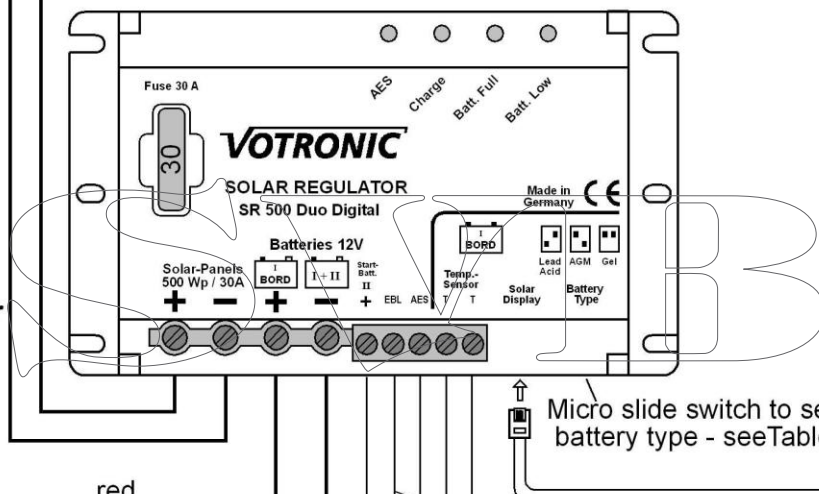


**Total Capacity of Panel:**  
 SR 130 max. 130 Watt  
 SR 200 max. 200 Watt  
 SR 300 max. 300 Watt  
 SR 400 max. 400 Watt  
 SR 500 max. 500 Watt

Option:  
 LCD Solar-Display Order No 1216  
 LCD Solar-Monitor Order No 1221

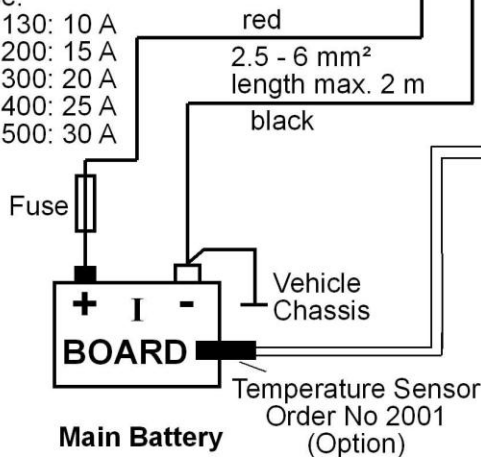


**Only vertical installation!**  
**The terminals must point down!**



**Install the solar controller near the main battery I!**

**Fuse:**  
 SR 130: 10 A  
 SR 200: 15 A  
 SR 300: 20 A  
 SR 400: 25 A  
 SR 500: 30 A



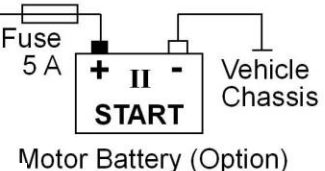
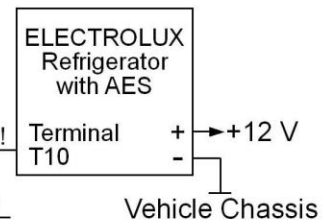
**Main Battery**

Micro slide switch to select battery type - see Table 1.

0.5 - 1.5 mm² lengths as needed

Option: Output "AES" only SR 300, SR 400 and SR 500!

Option: To EBL, charging current of the living space battery



**Motor Battery (Option)**

**HINT: Fuses should be connected directly at the batteries (cable protection)!**

Required Cable Cross-section, Hints	SR 130	SR 200	SR 300	SR 400	SR 500
+/- Panel Cables, length as needed	2.5 - 4 mm²	2.5 - 4 mm²	4 - 6 mm²	6 - 10 mm²	6 - 10 mm²
+/- Battery I Cables, length max. 2 m	2.5 - 4 mm²	2.5 - 4 mm²	4 - 6 mm²	6 - 10 mm²	6 - 10 mm²

\* \* If required, reduce the cross-section at the terminal.



**Cut-off Relay:** The cut-off relay, which exists in most of the vehicles, can still be used (the cut-off relay connects the board battery for charging to the starter battery during running motor of the vehicle. The cut-off relay is not included in the connection plan).

## Connection (See Connection Plan):

The polarities (+ and -) of solar panel and batteries are absolutely to be observed!

Observe the cross-section and length measures of the cables!



1. **Connection of the solar controller to the battery "Board I" should be effected first.**

**Protective Covering of Cables:**

**Insert the fuses near the batteries into the + cables (protection against cable fire)!**

2. **The solar panels should be protected from direct sunlight (by covering or shading) prior to connection.**

### 1. Main / Board Battery „BOARD I“ (must be connected):

Connect the **battery connections** of the controller - (Minus) and + (Plus) to the 12 V main battery, observing the correct polarity and the cross-section of the cables (**refer to connection plan**).

Never operate the controller without the battery „Board I“. If the battery is not connected, the unit will not deliver a defined output voltage.

In case of wrong polarity of battery I, the internal safety fuse will be released.

The replacement fuse should have the same capacity and it should be of the same type (car fuse)!

**Parallel charging** of two or several batteries of the same voltage (12 V) is admissible. The batteries are to be „paralleled“, i. e. the „+“ connections of the batteries have to be coupled and should be connected to the „+“ connection of the solar controller. The minus (-) connections have to be coupled in the same way.

According to the battery manufacturers, **permanent** parallel operation is admissible in case of two or several batteries of the same voltage, type, capacity, as well as of the same age (history) in cross connection.

### 2. Solar Panels:

Shade the panels to minimize sparking during connection and to avoid damages due to eventual wrong polarization

Observe the cable cross-sections (**refer to connection plan**)!

If several small solar panels are used, they are connected in parallel (**refer to connection plan**).

### 3. Starter Battery „START II“ (Option, can be connected):

Connect the **second charging port** to the second battery using the red connection cable (**wire cross-section 1.5 - 2.5 mm<sup>2</sup>**). This cable may be longer. In case of **non-utilization**, this terminal is **left free**.

If used, the output for starter battery II will be working with reduced voltage and charging current rates. Thus, the greater share of valuable solar power will be supplied to board/solar battery I being more suitable.

However, the vehicles starter battery II will be kept in a condition, that starting will always be possible, even in case of longer downtimes and during winter operation.



Connection of the negative pole „START II“ is not required, if the negative pole „BOARD I“ is connected to the vehicle body. Depending on the length of the cable, it may also be connected to the common negative connection of the solar controller or to the negative pole of „BOARD I“.

### 4. Plug-type Connection „Solar Display“ (Option, can be connected):

**6-pole tip jack** for connection of the **VOTRONIC Solar Displays** being ready for connection for optimum control of the solar system:

**LCD SOLAR DISPLAY**, Order No. 1216

Displayed Values: Battery voltage, charging current, charging capacity, stored capacity and energy (V, A, W, Ah, Wh).

**LCD SOLAR MONITOR**, Order No. 1221

Displayed Values: Battery voltage, charging current, charging capacity (V, A, W).

### 5. "EBL" Connection for Electrobloc with Display Panel DT... / LT... (Option, can be connected):

A **cable set for connection of the solar controller to the EBL, order No. 2007**, is required. (It is not included in the standard delivery scope of the controller).

At the terminal "EBL" the solar controller supplies a signal for display of the solar charging current of board battery I (battery living area), which is suitable for electrobloc EBL... with display panel DT.../LT...

The signal cable being required for that, as well as a connection cable for connection of the solar controller to the EBL are included in the set of EBL connection cables, cable lengths: 1 m, each.

Further information / possibilities of connection can be drawn from the manual being enclosed to the set of EBL connection cables.

### 6. „AES“ (Automatic Energy Selector) only SR 300 Duo Dig., SR 400 Duo Dig. and SR 500 Duo Dig. (Option, can be connected):

The delivery scope of DOMETIC / ELECTROLUX includes refrigerators with all-automatic energy selection (230 V AC, 12 V DC or gas).

Particularly in summer, a lot of excess energy might be produced due to strong solar radiation, full batteries and low energy consumption (e. g. lighting), which is left unused. The solar controller recognizes this condition and uses the „AES“ output to give a signal to the refrigerator, which will commutate from gas operation to 12 V operation to benefit from the excess energy (gas saving).

#### Connection:

Lead a single-pole cable (0.5-1.5 mm<sup>2</sup>) from the solar controller's terminal „AES“ to the refrigerator's terminal „T10“.

#### Functioning:

The solar controller recognizes the excess solar power (LED „AES“ is lighting). The refrigerator switches from gas operation to 12 V operation. This mode will be kept for at least half an hour to avoid that the refrigerator will be “swinging” between 12 V operation and gas operation.

Should the solar power be still sufficient, the 12 V operation of the refrigerator will be kept.

Should the solar power be insufficient, „AES“ will be switched off by the solar controller, the refrigerator will be switched to gas operation, it will keep this mode for at least half an hour, and the solar power will be used for recharge of the (possibly slightly discharged) battery.

### 7. Temperature Sensor, Input „T T“ (Option, can connected):

Connection for VOTRONIC External Temperature Sensor Order No. 2001

For automatic adaptation and correction of the charging voltage to the **battery temperature** (Temperature Compensation).

#### Installation:

The **thermal contact** of sensor and **battery "Board I"** (inside temperature) **should be well**. Thus, it should be screwed down to the negative pole or positive pole of the battery. It is also possible to fasten it at the sidewall centre of the battery casing. Ensure that the installation place is not influenced by any source of heat (motor unit, exhaust, heater etc.).

#### Connection:

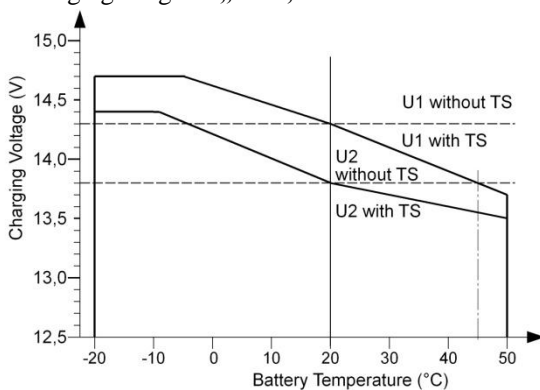
Connect the temperature sensor to the terminal by means of a 2-pole cable (cable cross-section 0.5 - 1.5 mm<sup>2</sup>). The polarity and cable length is of no importance. **The solar controller recognizes the sensor automatically.**

#### Effect:

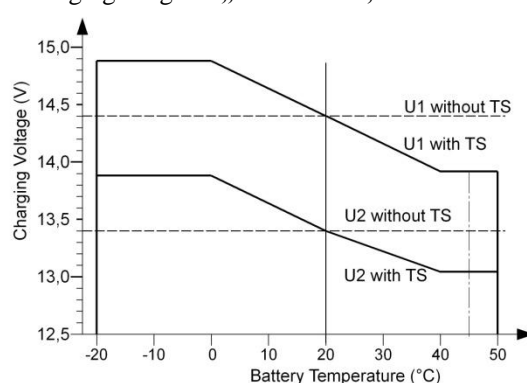
**The temperature-dependent charging voltage of battery I will be adapted automatically to the battery temperature.**

The temperature sensor measures the battery temperature. In case of low temperatures (winter operation), the charging voltage will be increased in order to improve and accelerate full charging of the weak battery. Sensitive consumers are protected by a limitation of the voltage in case of very low outside temperatures. In case of summery temperatures, the charging voltage is reduced to minimize the load (gassing) of the battery and to extend the lifetime of gas-tight batteries.

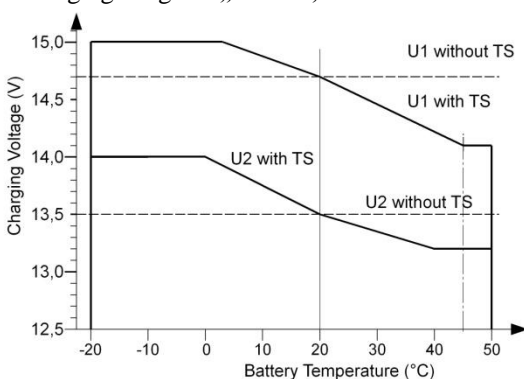
Charging Program „Gel“, Characteristic Line IU1oU2



Charging Program „Lead Acid“, Characteristic Line IU1oU2



Charging Program „AGM“, Characteristic Line IU1oU2



TS = Temperature Sensor

**Battery Protection:**

Automatic disconnection of the charging current for protection of the battery in case of battery temperatures below -20 °C and above +50 °C (return +45 °C). Any charging data being recorded hitherto will be kept in memory. Charging will be resumed automatically.



The solar controller recognizes automatically a missing sensor, cable break or short-circuit of the sensor lines, as well as unreasonable measuring values. In that case, it will switch to the usual charging voltage rates of 20 °C / 25 °C being recommended by the battery manufacturers.

**Table 1: For Main Battery I: How to set the correct charging program for the battery type (design, lead technology)**

Set the **2 slide switches ("Battery Type")** at the lateral side of the unit to the desired position for **Battery I (main battery)** using a small screwdriver.

<p>Battery „Type“ Selector Switch</p>	<p>If not being specified divergently by the battery manufacturer, the suitable charging program for the battery type (design, technology) can be determined by means of the following description and the technical data (voltage rates U1 and U2, nominal temperature and dwell times U1).                  Note: The possible parallel/floating operation with consumers being connected to the battery is also automatically considered by all charging programs.</p>								
	<p><b>„Lead Acid“:</b> Charging program for lead <b>acid/lead-acid</b> batteries:                  For charging and conservation of charge of <b>supply (board) batteries</b>. Ensures short charging times, high charging factor and acid mixing for open standard batteries and closed, low-maintenance, maintenance-free "non-solid electrolyte", "lead-acid", drive, lighting, solar and heavy duty batteries. Also suitable for recently developed batteries (low-antimonous, batteries with silver-alloy, calcium/calcium or similar) and batteries with low and very low water consumption, as well as <b>AGM</b> batteries with the indication <b>14.4 V</b>.</p> <p>Characteristic Line Acid IU1oU2:</p> <table border="0"> <tr> <td>U1 Main/Full Charging:</td> <td>14.40 V</td> <td>20 °C</td> <td>2.5-5 h</td> </tr> <tr> <td>U2 Full/Trickle/Storage Charging:</td> <td>13.40 V</td> <td>20 °C</td> <td>Continuous</td> </tr> </table>	U1 Main/Full Charging:	14.40 V	20 °C	2.5-5 h	U2 Full/Trickle/Storage Charging:	13.40 V	20 °C	Continuous
U1 Main/Full Charging:	14.40 V	20 °C	2.5-5 h						
U2 Full/Trickle/Storage Charging:	13.40 V	20 °C	Continuous						
	<p><b>„AGM“:</b> Charging Program for <b>AGM / Fleece</b> Batteries:                  Adapted to closed, gas-tight AGM (absorbed glass mat) batteries and batteries in lead-fleece technology requiring a particularly high level U1 for full charging.</p> <p><b>ATTENTION:</b> It is highly recommended to check the specification sheet of the battery concerning the high charging voltage U1 <b>14.7 V</b>.                  Unsuitable batteries might age prematurely due to loss of electrolyte!</p> <p>Some manufacturers of AGM / fleece batteries are also prescribing a <b>14.4 V</b> charging program for charging! In these cases, please set "Lead Acid (14.4 V / 13.4 V).</p> <p>Characteristic Line AGM- / Fleece IU1oU2:</p> <table border="0"> <tr> <td>U1 Main/Full Charging:</td> <td>14.70 V (!)</td> <td>20 °C</td> <td>2-6 h</td> </tr> <tr> <td>U2 Full/Trickle/Storage Charging:</td> <td>13.50 V</td> <td>20 °C</td> <td>Continuous</td> </tr> </table>	U1 Main/Full Charging:	14.70 V (!)	20 °C	2-6 h	U2 Full/Trickle/Storage Charging:	13.50 V	20 °C	Continuous
U1 Main/Full Charging:	14.70 V (!)	20 °C	2-6 h						
U2 Full/Trickle/Storage Charging:	13.50 V	20 °C	Continuous						
	<p><b>„Gel“:</b> Charging Program for <b>Gel/Dryfit</b> Batteries:                  Adapted to closed, gas-tight <b>Gel</b> batteries with determined electrolytes, which are generally requiring a higher charging voltage level and longer dwell times U1 to achieve short charging times with particularly high capacity storage and to avoid total discharge, e. g. EXIDE, Sonnenschein dryfit- Start, Dryfit-Sport-Line, DETA Gel Battery Funline, Bosch AS Gel Batteries Va/Z, AS Gel Drive Batteries, AS Gel Lighting Batteries.                  If not being specified divergently by the battery manufacturer, also recommended for batteries in round cell technology, such as EXIDE MAXXIMA (DC).</p> <p>EXIDE, DETA, VARTA Characteristic Line Gel IU1oU2:</p> <table border="0"> <tr> <td>U1 Main/Full Charging:</td> <td>14.30 V</td> <td>20 °C</td> <td>6-8 h</td> </tr> <tr> <td>U2 Full/Trickle/Storage Charging:</td> <td>13.80 V</td> <td>20 °C</td> <td>Continuous</td> </tr> </table>	U1 Main/Full Charging:	14.30 V	20 °C	6-8 h	U2 Full/Trickle/Storage Charging:	13.80 V	20 °C	Continuous
U1 Main/Full Charging:	14.30 V	20 °C	6-8 h						
U2 Full/Trickle/Storage Charging:	13.80 V	20 °C	Continuous						
	<p>Not used (operates like the "Lead Acid" program)</p>								

Now, the solar controller is ready for operation.

**Further actions or maintenance of the unit are not required.**

## Functions (at the Main / Board Battery „Board I“):

If **solar power is missing** (at night), readiness for service of the controller will be indicated by short **flashing** of the LED (Light-Emitting Diode) "**Charge**".

SR 300, 400 and 500: **In any operating state, a deep discharged battery** is indicated by means of the LED "**Batt. Low**" (low voltage). Now the battery has to be recharged as soon as possible (disconnect the consumers)!

An evenly flashing LED "**Charge**" indicates a possible failure in the system: Controller overheated or failure found during self-test, battery too hot (>50 °C) when using the battery temperature sensor.

As soon as the **solar power** is again **sufficient**, the LED "**Charge**" will be lighting and the charging process starts.

At the same time, the **brightness of the LED "Charge"** is a measure for the **converted solar power**: The brighter, the more of the existing (also little) solar power will be supplied.

1. Maximum charging current (**Phase I**) in the lower and mean voltage range of the battery up to the beginning of the phase U1. The total solar power will be supplied to the battery for quick charging. During the phase I, charging will be effected up to approx. 75 to 80 % charging state.
2. During the following **phase U1** the battery voltage will be kept constant on a high level close to the gassing limit, the battery determines the charging current according to its charging state, the high battery capacity will be charged and the LED "**Batt. Full**" is lighting slightly.  
The solar controller will control the charging time as well as the charging current and will switch automatically to the following phase U2=trickle charge.  
If the battery has already been fully charged, the charging time will be reduced accordingly.
3. During the **phase U2** (Full charging/trickle charge) the battery will be kept on its charging level. Only the compensating recharging current is flowing being required for conservation of the full charge, which is determined by the battery. The duration of that phase is not limited, the LED „**Batt. Full**“ is lighting intensively.  
Now, almost the entire solar current is available to the consumers.

Switching back to the phase I or U1 is effected, if the battery had been subject to load for an extended period or if the solar controller switches to stand-by mode after sunset.

If a temperature sensor is used for the battery, the voltage values will be slightly higher in case of low outside temperatures, while they will be slightly lower in case of high outside temperatures.

The output for the „Battery II“ (START) will be working with reduced voltage and charging current rates. Thus, the valuable solar power will be supplied to board/solar battery „I“ being more suitable. However, the starter battery „II“ will be kept in a condition, that starting will always be possible, even in case of longer stop periods (e. g. in winter).

### TIP

In case of unattended operation, the battery might be totally discharged due to too many consumers and lack of solar power. We recommend to protect the battery by means of the following appliances:

Votronic	<b>Battery Protector 40</b>	(Rating 12 V / 40 A)	<b>Order No. 3075.</b>
Votronic	<b>Battery Protector 100</b>	(Rating 12 V / 100 A)	<b>Order No. 3078.</b>

## Operating Instructions:

- **Lifetime of the battery: Recharge totally discharged batteries as soon as possible:**
- **Sulphation** of the battery plates due to total discharge is to be prevented by **soon charging**, particularly in case of high ambient temperatures. If the grade of sulphation is not too intensive, the battery can recover part of the battery capacity after **several charging/discharging cycles**.
- **Lifetime of the battery: Partially Discharged Batteries:**  
In contrast to other battery types, batteries on lead basis **do not have any** harmful memory effect. Consequently: In case of doubt, partially discharged batteries have to be **charged fully** as soon as possible.  
**Store only fully charged batteries** and recharge them periodically, particularly in case of used (older) batteries and higher temperatures.
- **Lifetime of the battery:** Keep batteries cool; choose an appropriate location for installation.
- **Lifetime of the battery:** In case of insufficient solar power and / or high current consumption, the battery should be subject to occasional full charging by means of a mains supply charger.
- **Overvoltage Limitation:**  
Sensitive consumers are protected by means of a limitation of the charging voltage to max. 15.0 V during all modes of charging.
- **Overload / Overheating Protection Solar Controller:**  
The solar controller is equipped with a double electronic protection against overload and with an automatic protection against adverse installation conditions (e. g. insufficient ventilation, excessive ambient temperatures) by gradual reduction of the charging capacity.

<b>Technical Data:</b>	<b>SR 130 Duo Digital</b>	<b>SR 200 Duo Digital</b>	<b>SR 300 Duo Digital</b>	<b>SR 400 Duo Digital</b>	<b>SR 500 Duo Digital</b>
Capacity of Solar Module (recommended - max.):	50 – 130 Wp	50 – 200 Wp	50 – 300 Wp	50 – 400 Wp	50 – 500 Wp
Current Solar Module:	0 – 8.2 A	0 – 13.0 A	0 – 19.0 A	0 – 25.0 A	0 – 30.0 A
Voltage Solar Module:	max. 28 V	max. 28 V	max. 28 V	max. 28 V	max. 28 V
Nominal Voltages of Batteries Board I and Start II:	12 V	12 V	12 V	12 V	12 V
Charging Current:	0 – 8.2 A	0 – 13.0 A	0 – 19.0 A	0 – 25.0 A	0 – 30.0 A
Stand By current consumption:	3 mA	3 mA	3 mA	3 mA	3 mA
<b>Main Port Battery I (BOARD I):</b>					
Charging Voltage Limitation (max.):	15.0 V	15.0 V	15.0 V	15.0 V	15.0 V
Max. Prelim. Charg. Current (totally discharged battery):	4.2 A (<8 V)	6.6 A (<8 V)	8.7 A (<8 V)	12.8 A (<8 V)	15.5 A (<8 V)
Charging/Floating/Load Current:	0 – 8.2 A	0 – 13.0 A	0 – 19.0 A	0 – 25.0 A	0 – 30.0 A
Reset Voltage (30 sec):	12.7 V	12.7 V	12.7 V	12.7 V	12.7 V
Charging Programs for <b>Gel/AGM/Acid</b> Batteries:	Yes	Yes	Yes	Yes	Yes
Integrated Overload Protection (Current limiting device):	Yes	Yes	Yes	Yes	Yes
Integrated Protection against Short-circuit:	Yes	Yes	Yes	Yes	Yes
Integrated Protection against Overtemperature:	Yes	Yes	Yes	Yes	Yes
Integrated Cooling Fan with Temp. Control:	--	--	--	Yes	Yes
Unit Fuse (Type FKS):	10 A	15 A	20 A	25 A	30 A
Input Battery I -Temperature Sensor:	Yes	Yes	Yes	Yes	Yes
Charging Timer:	2-fold	2-fold	3-fold	3-fold	3-fold
Refrigerator Control Output "AES":	--	--	Yes	Yes	Yes
Signal output "EBL" for display of the "solar" charging current of the living space battery:	Yes	Yes	Yes	Yes	Yes
<b>Auxiliary Port Vehicle Starter Battery II (Start II):</b>					
Charging Current:	0 – 0.8 A	0 – 0.8 A	0 – 1.5 A	0 – 1.5 A	0 – 1.5 A
Integrated Overload Protection (Current limiting device):	Yes	Yes	Yes	Yes	Yes
Integrated Protection against Short-circuit:	Yes	Yes	Yes	Yes	Yes
Integrated Protection against Overtemperature:	Yes	Yes	Yes	Yes	Yes
Dimensions incl. Mounting Flanges (mm):	118 x 71 x 34	118 x 71 x 34	118 x 71 x 34	118 x 71 x 34	118 x 71 x 34
Weight:	105 g	110 g	120 g	125 g	130 g
Ambient conditions, humidity of air:	max. 95 % RH, no condensation				

<b>Delivery Scope:</b>	<b>Available Accessories:</b>	
• Solar Controller	– Temperature Sensor	Order No. 2001
• Operating Manual	– LCD Solar Display	Order No. 1216
	– LCD Solar Monitor	Order No. 1221
	– Cable set for connection of the solar controller to the EBL	Order No. 2007



**Declaration of Conformity:**

According to the stipulations of the regulations 2006/95/EG, 2004/108/EG, 95/54/EG this product corresponds to the following standards or standardized documents:  
 EN55014; EN55022 B; DIN14685; DIN40839-1;  
 EN61000-4-2; EN61000-4-3; EN 61000-4-4.



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