

Front view



Side view

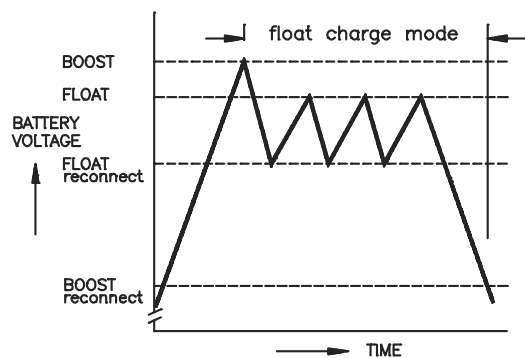
A solar charge controller is the most important system component which regulates the power from the solar modules to the battery bank and the power from the battery bank to the load(s). It protects the battery against the damaging effects of over-charge and excessive discharge by keeping the charge/discharge cycle within prescribed limits. The special charge regulating technique enables a more efficient use of the available energy and the battery is charged faster compared to conventional controllers.

A combined external battery voltage and temperature sensor is standard.

### Operation

The charge controller can switch on and off three separated module strings.

For maximum battery efficiency (for a longer lifetime) the charge controller performs a boost and float charge process (see diagram). This means that initially the battery is charged to a somewhat higher voltage, after that, the voltage is kept at a float charge level by selecting the appropriate number of module strings. The charge voltage levels are temperature compensated.



Charge principle

The switching frequency and resulting electro-magnetic field complies with EMC-regulations.

When the battery connection is interrupted the modules will switch off within 0,1 seconds to avoid any damage to the appliances by the higher open circuit voltage of the modules. A battery (system) voltage of more than the given values (System High Voltage), see table below, will switch off the load relay.

At low State Of Charge of the battery the Charge Control Unit will switch off the load.

When the batteries are recharged to a higher state of charge afterwards, the load is switched on again automatically. An electronic current limiter protects the output(s) against overload and short circuit.

### Indicators, controls and other functions

- **Yellow LED “OPERATIONAL”**

This LED indicates that the control unit is connected correctly (polarity) and is ready for operation.

- **Green LED “BATTERY CHARGED”**

This LED is ON if the boost charge voltage level is reached and indicates that the controller is in float charge mode. This LED is on until the battery is discharged with a small percentage of the total battery capacity, e.g. during the night.

- **Three green LED's “SUB-ARRAY DISCONNECT”**

One or more LED's can be ON during float charge mode and indicate the specific sub-array is disconnected. The CCU-IV selects the number of connected sub-arrays in such a way that charge current is as high as possible without exceeding the float charge (gassing) voltage. The controller will react on changing solar radiation conditions within seconds. During boost charge mode, all the green LED's are OFF. If one or more slave units are operational, the corresponding LED's on those units will follow the master.

- **Red LED “PRE-WARNING LOW VOLTAGE”**

This LED is ON if battery voltage drops dramatically and in a properly sized system, it indicates an abnormal situation. This can be caused by an extremely long low solar radiation period, dirty/damaged solar panels or higher energy consumption by the load.

If the option pre-warning low voltage alarm relay is mounted, this will be activated together with the LED. If an optional “non essential load” output is available, it will be disconnected.

- **Red LED “GENERAL ALARM/LOAD DISCONNECT”**

If this LED is "ON" the internal 25A (12-24V version) or 16A (48V version) output relay, or the optional 60A (12-24 Vdc) or 40A (48 Vdc) output relay unit, will disconnect the load(s) and the optional alarm relay will be activated.

The alarm can be caused by two different situations:

A: Battery low voltage:

In this case the “GENERAL ALARM/LOAD DISCONNECT” LED is ON and the corresponding alarm relay is activated. For reasons see pre-warning low voltage.

B: System high voltage:

In this case the “GENERAL ALARM/LOAD DISCONNECT” LED and all green LED's are ON. Possible reasons for this situation are disconnected batteries cable, defective battery fuse, defective WT charge controller.

**Potentiometer “V charge/cell (at 20°C)”**

The potentiometer is standard in the calibrated neutral position, i.e. 2,37 V/cell.

The potentiometer affects both float and boost charge voltage setting. Dependent of the battery type, capacity, load and operating conditions the recharge time and water usage (flooded types) of the battery is optimised by adjusting the float charge setting. Therefore we recommend consulting Tss4U first before adjusting the float charge setting of the controller.

**Test switch**

The test switch simulates a high or a low battery voltage (not a system high voltage). The system voltage is measured on battery power terminals inside the controller. With this switch the main functions of the controller can be tested.

Moving the switch to the high voltage position, the green LED's will be ON and the sub arrays be disconnected immediately (also on the slaves if present). The switch will return to its neutral position when released. The controller will need up to fifteen seconds to resume normal operation.

After moving and holding the switch to the low voltage position, the pre-warning low voltage LED will be ON. Five to fifteen seconds later, the general alarm LED will be ON and the output relay(s) is (are) activated. After releasing the switch the controller needs up to fifteen seconds to resume normal operation.

**Overload or short circuit protection of the output**

In case of overload or shortcut circuit of the output, the internal electronic protected solid-state switch will switch off the load. A LED on the front does not indicate this. For safety reasons, the load is not switched on again automatically.

To restore power to the load:

- Trace and correct the problem which caused the overload.
- Push the test switch to low position and hold until the red LED (general alarm/load disconnect) is ON.
- Release the switch and wait until both red LED's are off, the power is now restored.

**Optional**

Alarm relays with voltage-free contacts for pre-warning low voltage and general alarm.

The alarm status for different system conditions is as follows:

Status overview (for 12, 24 and 48 V systems)					
Conditioning			Pre-warning alarm relay	General alarm relay	Load
Normal (12 V)	Normal (24 V)	Normal (48 V)	OFF	OFF	ON
Vbat <11,8 V	Vbat <23,6 V	Vbat <47,2 V	ACTIVE	OFF	ON
Vbat <11,5 V	Vbat <23,0 V	Vbat <46,0 V	ACTIVE	ACTIVE	OFF
Vbat >15,3 V	Vbat >30,5 V	Vbat >61,0 V	OFF	ACTIVE	OFF