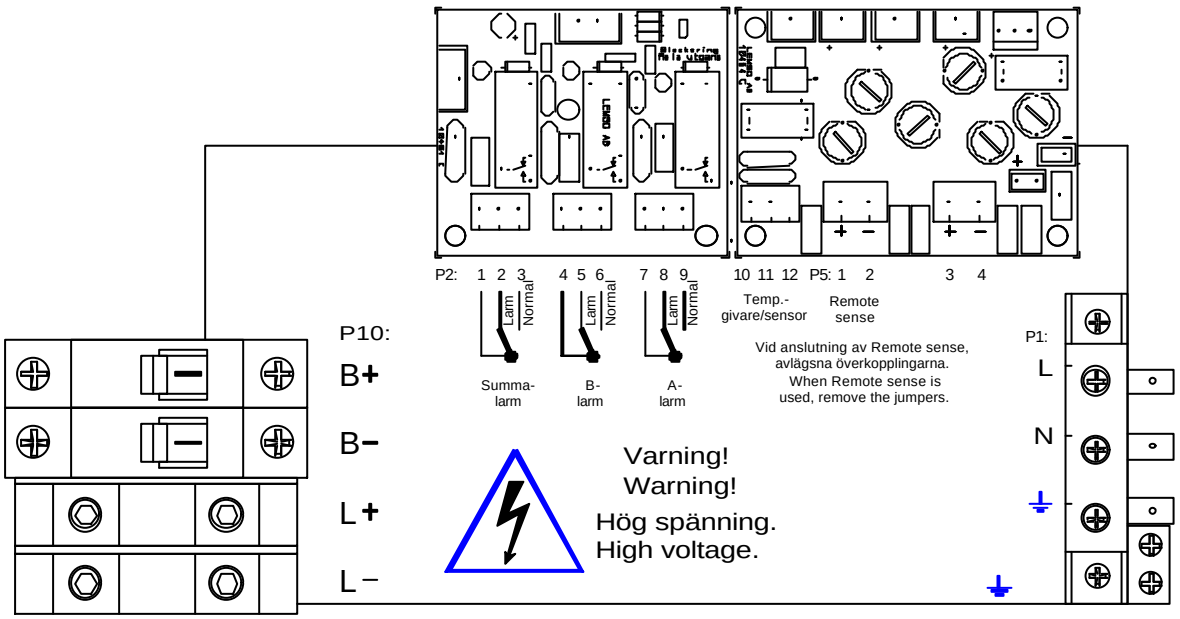
Constant voltage
Rectifier type UP 610 with PFC

Mechanical assembly

The rectifier is assembled in a cabinet intended for indoor wall mounting. The cabinet has ventilation holes on both sides and in the bottom, to facilitate cooling by fan and also to have an covered top side.

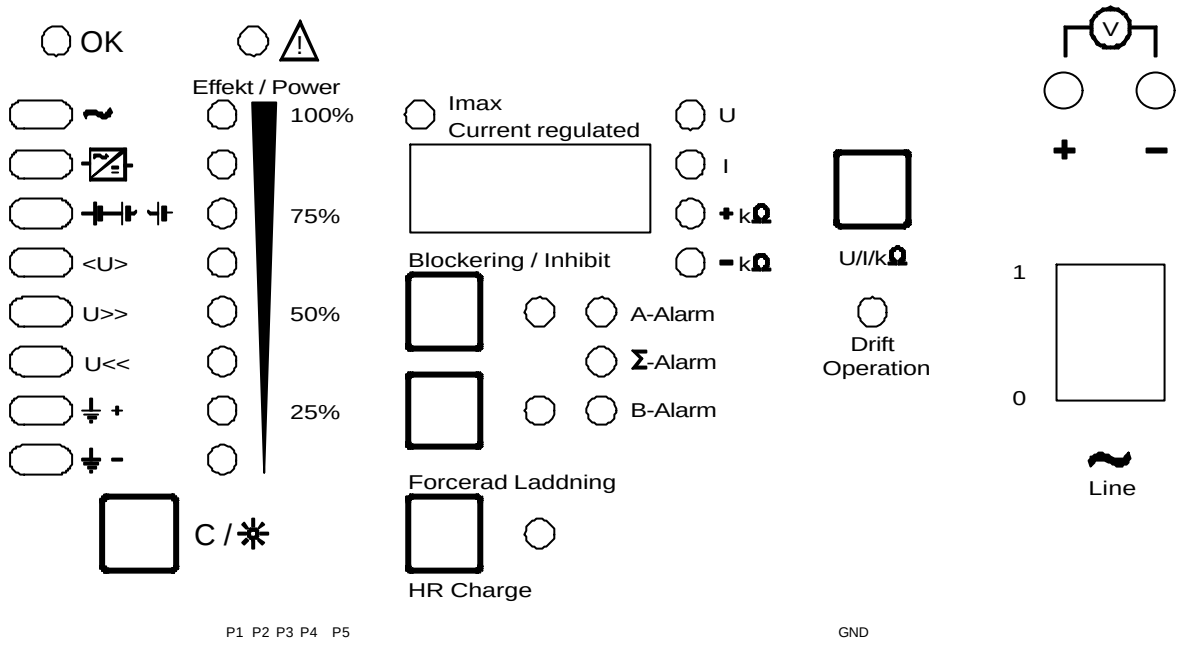
The rectifiers main circuit is assembled on a metal plate in the bottom of the cabinet. This plate also works as the base for the whole rectifier unit. The main circuit complies of 1,2 or 3 power boards that are controlled by a control board. This control board is placed on the top power board in its left foremost corner. The control board has several trim potentiometers for adjusting output voltage and so on. Please refer to “Adjustment of power board” further back in this documentation.
Over the rectifier, there is a cover. This cover can easily be removed for installation and service. Also the cable inlet plate at the bottom of the unit, can be removed for aiding the disassembly, in case of servicing the unit.

The terminal block for **input** AC-voltage, is located to the right in the bottom of the cabinet (P1). There is also an additional GND connection on the M4 screw just below the terminal block P1. The terminals for **output** DC and **battery** (P10), are located to the left of the cabinet. The **alarm** terminals for A- ,B- and Sum- alarm are located in the middle of the cabinet, between the input and output terminals (P2:1-9). On the PCB with the alarm relays there are 3 green LED's. These LED's will light when there are no alarms, that is when the respective alarm relays are pulled.
Temperature sensor (option) is connected to P2:10-12.



The two automatic fuses that are situated above the battery fuses are the output fuses for the rectifier itself.

In the upper part of the cabinet there is a metal profile on which the printed circuit board for the alarm LED's and digital instrument is mounted. On the same metal profile the front panel is glued. The front panel can be reached through a hole cut in the cover, when the cover of the rectifier is closed.



To the right on the front panel there is a **LINE** switch, for controlling power **on - off** of the rectifier. To the left of the switch there is a green LED (Operation) that is on when the power boards are working, and that is normally the same as that there is line voltage present. PLEASE OBSERVE that if the LED is off, this can **NOT** be used as an indication of that there is no voltage present inside the unit.
Above the LINE switch there are two 4 mm panel sockets for control measurement of the rectifiers output voltage by an external voltmeter.
In the center of the panel is a digital display. On this display you can see the chargers output voltage, output current or the ground fault resistance on the positive and negative side. What currently is shown on the display is indicated by the four LED's to the right of the digital display. By pressing the switch "**U/I/kW**" you can switch between the different measurements options. Ground fault resistance can be measured from 100 kohm - 1000 kohm (1 Mohm). Measurement values under 100 kohm are shown as 90 and values over 1000 kohm are shown with 999.

To the left on the front panel there are LED's for alarm indication. Beneath the two columns of LED's, there is a push button for **LAMPTEST / RESET.** When this button is pressed, all the LED's on the front panel will light up for lamptest control, (in an sequence from left to right) and at the same time the alarm relays are reset.

All alarms expect ground failure are connected to A-alarm. Ground failure is correspondingly connected to B-alarm. Besides that both A- and B-alarm controls Sum-alarm.

A- alternatively B- alarm relay and Sum-alarm relay falls when the selected time delay has passed and the alarm still is active.

Alarm relays are reset (pulled) when the Lamptest/reset button is pressed. If the alarm is still active the alarm relays will again fall when the delay time again is passed.

Alarm is first indicated by a flashing yellow LED. If the alarm only exists for a period shorter than the alarm delay time, the yellow LED goes out when the alarm disappears. On the other hand, if the alarm condition exists for a period longer than the delay time, that is until an alarm relay has fallen, then the alarm is indicated by a red blinking LED. If the alarm now disappears the LED will continue to blink. If the Lamptest/reset button is pressed LED's indicating alarms that are no longer active will go out. LED's indicating alarms that are still active will become continuously on. When an alarm for which the red LED is continuos on disappears and comes back again, the red LED will go off and the yellow LED will start to flash again.

The alarm can be selected as "auto reset" which means if the alarm has existed so long time that the alarm relays had fallen, this relay will activate (pull) if the alarm disappears again. However the LED connected to the alarm that made the relay to fall will not extinguish but continue to light so that an indication of what caused the relay to fall in the first place can be seen on the LED's. The LED's can as usual be manually reset by pushing the Lamptest/reset button.

On the 3 red LED:s under the display you can see if any of A-, B- or Sum- alarm relays has fallen. With the 2 push buttons **Inhibit** under the display you can inhibit A- or B- alarm (and then if both are used Sum- alarm). When an alarm is inhibited the yellow LED to the right of the Inhibit button will light up to indicate that this alarm is blocked.

Also individual alarms can be blocked (see “Adjustment for alarm board” later in this documentation). If an individual alarm is blocked the corresponding yellow led for this alarm is continuously on.

The green LED marked “OK” lights when the system works normal and there are no alarms. If any alarm is blocked the green OK led is not lit. The led “!” is working in opposite to the led OK.

With the pushbutton **HR charge,** a manual high rate charging cycle is started, and also if needed, the high rate charging cycle can be stopped. If a high rate charge cycle has been automatically started after a line interruption, this cycle can be stopped by this button. The yellow LED to the right if this button indicates that a high rate charging cycle is in progress or is about to start (se below). If automatic start of high rate charging cycle after line interruption is chosen, then the function is as follows: After the line interruption the alarm card checks to see if the charger operates in current limit. If this is the case, the time for current limit operation is measured and if this time is more then 45 sec, a high rate charging cycle is initiated and the yellow LED is turned on. The charging level is however not increased and the timer for high rate charging time is not yet started. Not until the charger leaves current limit the charging level is increased and the timer is started. Now the charger stays at this higher voltage level for the prescribed time and

when the high rate charging cycle is over the charge level returns to normal float level and the yellow LED goes out. If the pushbutton is pressed any time during the cycle the charger returns to normal float level and the yellow LED goes out.

At the same time as the high rate charge cycle begins an relay (option) is activated for control of an fan in the battery room. This relay stays activated for a time after the high rate charge cycle is over. This time can be chosen between 2 different times by a dipswitch on the alarm board. (See the instruction for the alarm board later in this documentation.)

If the charger is operating at current limit, that is the charger is giving its maximum current and the battery voltage is to low, the yellow led just above the displays top left corner is lit. During this time the float voltage alarms are inhibited and only high and low battery voltage alarm is active. This arrangement gives that during the recharge time after a line interruption when the charger is working in current limit there are no float voltage alarms. When the correct float voltage level is reach the float voltage alarm is automatically activated again.

If the door to the cabinet is open, there is a jumper situated under the "**U/I/kW**" button just outside the front panel marked "GND". This jumper shall normally be installed, but in special applications when the internal ground resistance measuring circuit is not used and can not be connected to protective ground this jumper shall be removed. This can be the case for instance if an external ground resistance-measuring device is installed. When the jumper is removed the internal ground resistance-measuring circuit and ground fault alarm of course is not functioning.

To the left of the front panel is a hole in the panel. It is possible through this hole to adjust and check the alarm board. To adjust the alarm board, see instructions:
"Adjustment of alarm board"

Temperature compensation of charge voltage. (Sensor option.)

If a temperature sensor (option) is fitted to the unit, the rectifier can adjust the charge voltage level according to the battery temperature. This compensation is factory adjusted to 3.3 mV/cell & ºC for lead acid batteries and 2mV/cell & ºC for alkaline (Ni-Cd) batteries inside ±20ºC around 20ºC. The alarm level for float charge is also adjusted in the same degree. Se also instructions: "Adjustment of alarm board"

Installation of temperature sensor.

Turn the unit OFF and open the battery circuit barkers before installing the temperature sensor. Connect the **BLUE** wire from the sensor to **P2: 12** and the **BROWN** wire to **P2: 11.**

Then the function for temperature controlled charge level must be activated with the dipswitch SW7 pos 7 on the alarm board, that shall now be put in ON position.

Installation

The rectifier is intended for indoor wall mounting and stationary installations. The installation is to be carried out by a qualified and experienced person because there is **high voltage** on the rectifier's input and output side. Over and under the rectifier there has to be a free space of app. 200-mm in order to get access to the screws that hold the cover of the cabinet. Also there has to be a free space of app. 150-mm on both sides of the rectifier in order to achieve sufficient cooling.

Before the rectifier is connected, the following shall be controlled:

1. Inspect the charger for transportation damage.
2. Inspect the charger's type label and the enclosed documents describing how the rectifier is adjusted so they correspond to the line voltage and battery voltage.
3. Make sure that the LINE switch is in **0** position.
4. Make sure that the BATTERY circuit breakers are in OFF position.
5. Make sure that the CHARGER circuit breakers are in ON position.

Connection

Input and output cables are to be drawn through the seven inlets holes in the bottom of the cabinet, all directed downwards.

The input power cable connects to terminal **P1**: **L**, **N**, **GND** (Line, Neutral and Protective Ground). Additional Protective ground connection can be made on the M4 terminal just below the line terminal. If additional protective ground connection is wanted, this connection can also be made to one of the two M6 holes in the two top corners of the cable inlet plate.

The output DC connects to the terminals labelled P10: **L+** and **L-**.

The battery connects to the automatic fuse labelled P10, **B+** and **B-**.

Alarm outputs for **A-, B-** and **Sum-alarm,** connects to terminal P2: 1-9. See schematics at the terminals.

Are remote sense going to be used, the sense cables shall be connected to P5:1 and 2 "Remote sense +" and "Remote sense -".
The jumper cables between P5:1-3 and 2-4 are then removed. If remote sense is not used these terminals shall be jumped.

There is also an block diagram of the chargers internal connection at the end of this documentation.

Operation

The charger is turned on by pressing the **Line** switch on the front panel to **1** position. After a couple of seconds, the digital display for voltage and current reading, lights up. By pressing the "U/I/KΩ" button, the display switches between voltage, current measurement and ground fault resistance. Please check one additional time that the battery is connected with the correct polarity. If possible, use a voltmeter to check the polarity. Then the battery fuses can be turned on. As the battery probably is discharged, the charger goes into current limit a number of hours until the correct battery voltage is obtained. (If the charger is started as above before the battery fuses are closed, you will not experience any sparks when the battery is connected.)

Technical specification

Charger:

AC input voltage	230V +15% -15%, 1-phase 50 or 60 Hz
Power factor	Better than 0.98
DC output voltage	Nominal 12, 24, 48,110 or 220V DC
Load and line regulation	Better than ± 0,05%
Output current limit	102-105% of nominal current
Characteristics	I/U according to DIN 41773
Efficiency	Better than 85%
Ripple	Better than 0,05% RMS
RFI / EMI	According to EN 55022 B and CISPER 22 B
Cabinet	IP40 wall mounted

Standard Alarms:

Mains power failure	A-alarm + Sum-alarm.
Charger failure	A-alarm + Sum-alarm.
Battery circuit failure	A-alarm + Sum-alarm.
Floating voltage failure over and under	A-alarm + Sum-alarm.
High battery voltage	A-alarm + Sum-alarm.
Low battery voltage	A-alarm + Sum-alarm.
Ground fault +	B-alarm + Sum-alarm.
Ground fault -	B-alarm + Sum-alarm.

Reset and lamptest

A-Alarm	B-Alarm	Sum-Alarm
adjustable delay	adjustable delay	relay with change
relay with change over contact	relay with change over contact	over contact

Surveillance

Mains power failure	Fault in the power supply to the charger.
Charger failure	Rectifier fuse fault. Temperature-sensor failure or to low/high battery temperature. Rectifier fault.
Battery circuit failure	The rectifiers output voltage is reduced to approximatly1.9V/cell ones every 24 hours. Alarm is given if the output DC voltage follows the rectifiers output voltage, that is the battery does not take over the load current.
Charge voltage	U_{float} ± 1 alt. 2% or ± 2 off $U_{high\ rate}$
Low battery voltage	0.87 x U_{float}
High battery voltage	1.04 x U_{float} or 1.04 x $U_{high\ rate}$
Ground fault + and - measuring range.	0.1-1.0 Mohm
Ground fault + and - alarm levels.	500 kohm or 250 kohm
Delay time, A-alarm	14 steps, each step 10 sec and also 3 and 5 min.
Delay time, B-alarm	14 steps, each step 0.5 min and also 15 and 30 min.
High rate charge time	15 steps, each step 1 hour max 15 h.

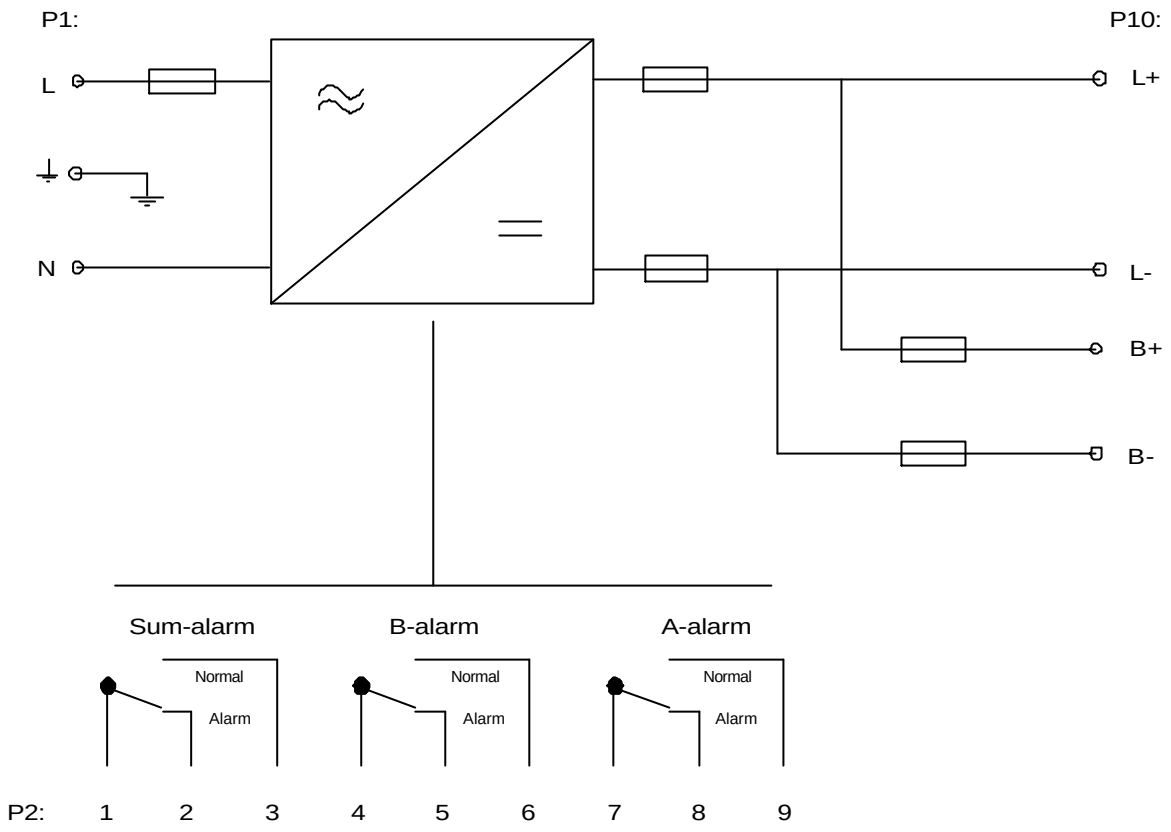
Option

External temperature sensor.

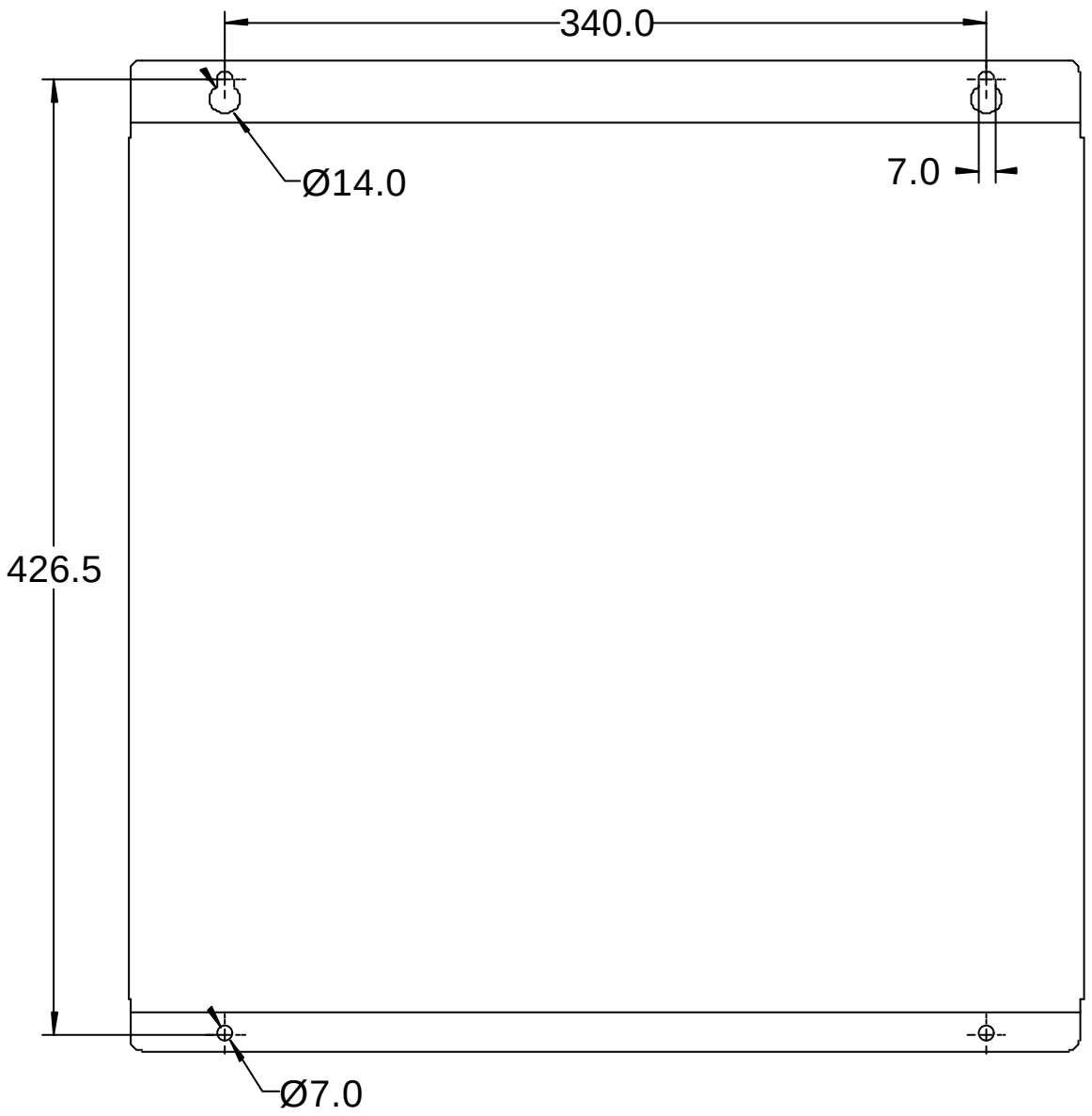
Please refer to the type label on the cabinets lower right side for information about the rectifiers output voltage and maximum current.

We are continuously developing our products, and therefor reserves the right to make technical redesigns without prior notice.

BLOCK DIAGRAM



Drill pattern:



Fuse table

NOTE: All fuses are 5 x 20mm and with high braking capability (1500A).

Relay/fuse board

(In the middle of the mounting plate.)

Battery voltage	12V	24-220V
F1	500mAT	500mAT
F2	500mAT	500mAT
F3	500mAT	500mAT
F4	500mAT	500mAT
F5	1,6AT	800mAT
F6	1,6AT	800mAT

Power board 1000W

F1	6.3AT
F2	6.3AT
F3	125mAF

Power board 300W

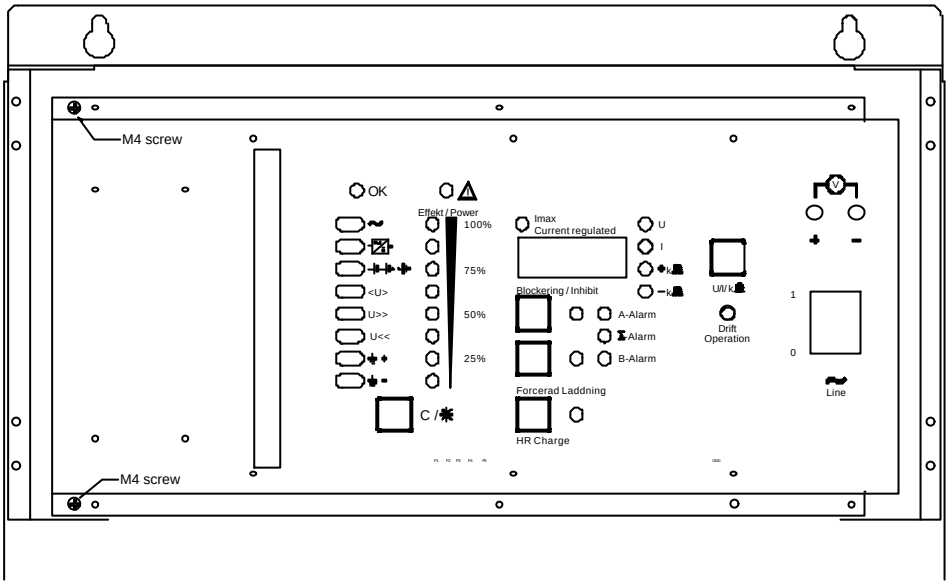
F1	3,15AT

If a fuse has been blown, the likelihood that the unit shall work normally after that the fuse is exchanged is very small. Therefor it is recommended that instead the unit is sent to a qualified repair centre instead.

Adjusting of 1000W power board

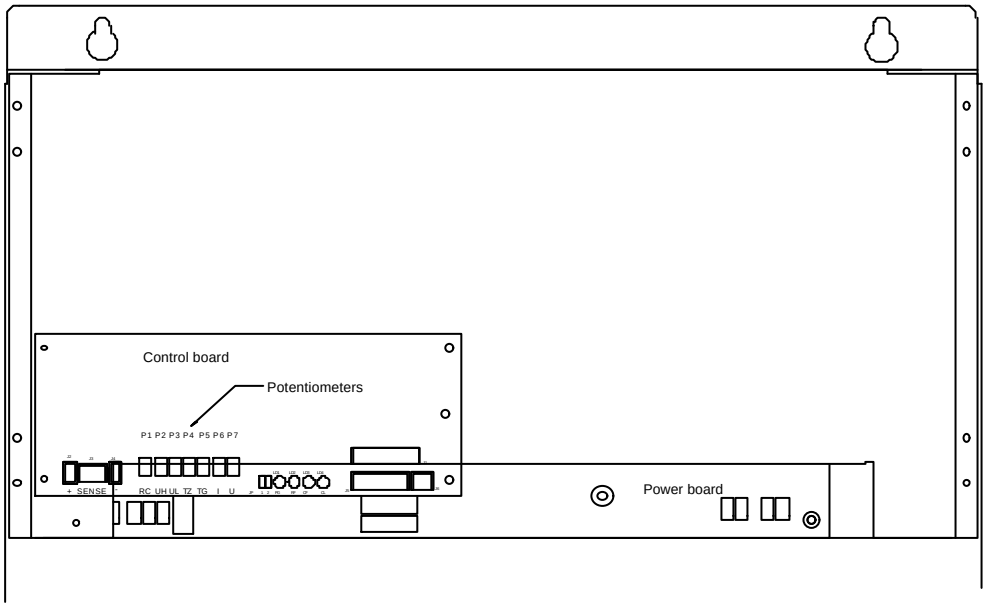
Please observe that high voltages are present in the cabinet and on the rectifier PCB and strict caution must be observed during adjustment.

To gain access to the potentiometers on the power PCB the cover shall be removed. And the profile that holds the alarm and display PCB must be swivelled to the right. This can be done by removing the 2 M4 screws in the top and bottom left corners on the profile, see fig below. Than the profile can be swivelled.



The load and the battery shall also be disconnected prior to the adjusting. Please also note that these adjustments only affect the rectifier and that the alarm card also might need adjustment if the charge level is changed.

Now the 7 potentiometers on the power board's control board (the small board to the left on top of the uppermost power board) are easily accessible (see fig below).



Please observe that the potentiometers on the power board itself MUST NOT be changed.

Document 11604/11605/11606/11607/11608 (depending of the units system voltage) shall be available during the adjustment procedure. This is because **only** voltage levels available in this document can be used without having alarms. OBSERVE that if the charging voltage is changed to correspond to a new row in this document, then the alarm board has to be changed accordingly to this new value.

If the output voltage is measured in the 4-mm panel sockets, make sure the voltmeter has an input impedance off at least 10Mohm.

Tip: When adjusting the rectifier's output voltage, an better accuracy can be achieved on the display by putting SW8:8 in ON position, see also "Adjusting alarm board" in this documentation.

OBSERVE: The values that normally may have to be adjusted are Float voltage "U" P7, High rate charge voltage "H" P2 and Battery circuit alarm test level "L" P3. The rest of the potentiometers shall normally not be adjusted.

Float voltage "U" P7

Potentiometer "U" shall be adjusted so that the output voltage correspond to the selected alarm level,
(32 selectable values are available on the alarm, and those are chosen by **SW5** and **SW7:1**). See also "Adjusting alarm board" in this documentation.
During this adjustment the switch **SW7:7** (temperate controlled charge level) shall be in OFF position (left). After the adjustment, do not forget to set **SW7:7** in its original position if the switch setting was altered during the adjustment procedure.

High rate charge level "H" P2

To adjust this level the charger shall be put in high rate charging mode with the push button on the front panel. That the charger is operating at high rate is indicated by that the yellow led beside this switch is on. (To be able to put the charger in high rate mode **SW6** (alarm board) must be in an position other than 0 and **SW8: 2** in **ON** (right) position.
Now adjust the chargers output voltage with **P2** to the desired level and then return **SW6** and **SW8:2** to there original positions if these switches were changed prior to the adjustment.
OBSERVE: High rate level must as usual correspond to the values listed on the document describing possible charging levels (11604/11605/11606/11607/11608).

Battery circuit test level "L" P3

This is used for Battery circuit failure alarm. To adjust this level the charger must be put at battery circuit test voltage level. This is done by setting **SW8:7** (on the alarm board) in ON (right) position (simulates battery circuit test).
Then adjust the output voltage by means of **P3** to get it to **0,852** x normal charge level.
Example: 110V system 54 cells and 2.27V/cell have a normal charge level of 122.58V. So with **SW8:7** in ON position the output voltage shall be adjusted to
122.58V x 0.852=104.4V. Reset **SW8:7** to OFF after the adjustment is done.

Temperature compensation "TG" P5

12 Volts system. Factory set to give a charge level variation of ±**0.396V** at a temperature variation of 20 degrees around the temperature compensation zero point.
24 Volts system. Factory set to give a charge level variation of ±**0.792V** at a temperature variation of 20 degrees around the temperature compensation zero point.
48 Volts system. Factory set to give a charge level variation of ±**1.584V** at a temperature variation of 20 degrees around the temperature compensation zero point.
110 Volts system. Factory set to give a charge level variation of ±**3.564V** at a temperature variation of 20 degrees around the temperature compensation zero point.
220 Volts system. Factory set to give a charge level variation of ±**7.128V** at a temperature variation of 20 degrees around the temperature compensation zero point.

The adjustment is done as to achieve these voltage variations.
Set **SW8:6** on the alarm board in ON position (this simulates a temperature rise of 20ºC).
Now adjust potentiometer **P5** on the control board as to get an output voltage reduction corresponding to the value stated above for the system voltage in question.
Example: 110 Volts-system, normal cell voltage 2.27V and 54 cells gives normal output voltage 122.58V. So in this case adjust **P5** to get 122.58V-3.564V=119.02V.
Remember to set **SW8:6** on the alarm board in OFF position after this adjustment is done.

Adjustment of remote sense "RC" P1

Factory pre-set and **not** to be adjusted.

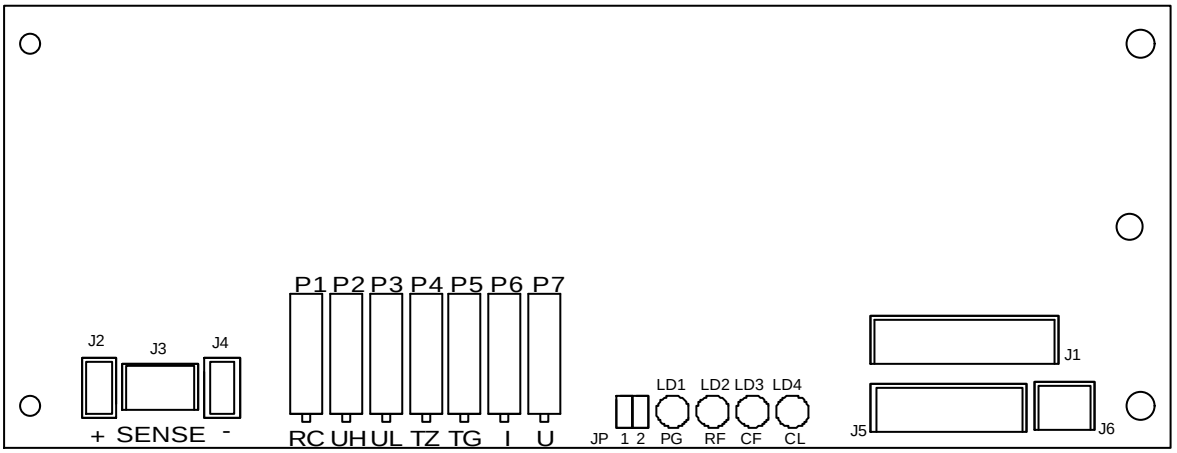
Zero adjustment for temperature compensation "TZ" P4

Zero point adjusted to +**20°C**.
Factory pre-set and **not** to be adjusted by customer.

Adjustment of current "I" P9

Factory pre-set to **102% ±2%** of the charger maximum current and shall **not** be adjusted.
A yellow led **CL** (**LD4)** indicates when the charger is operating at current limit.

Control board:

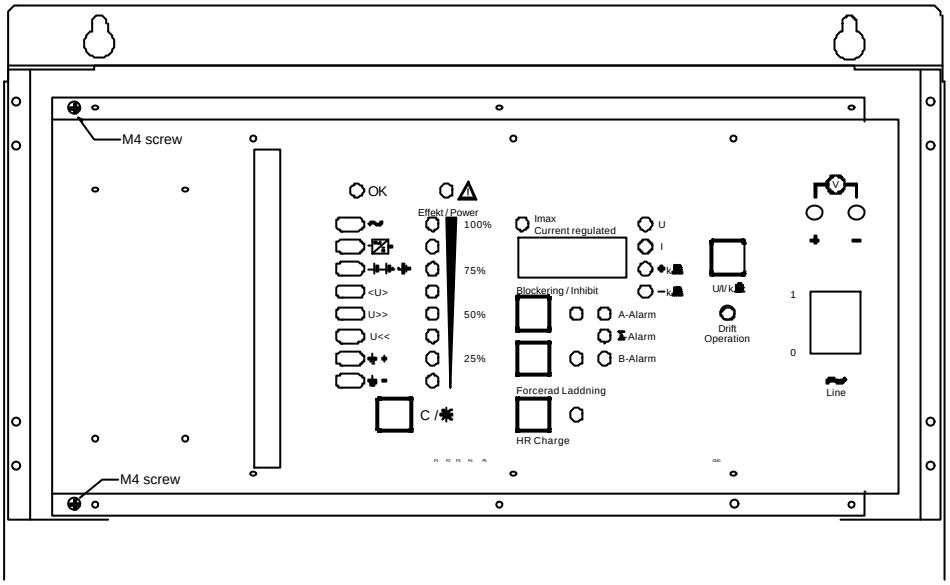


LED: PG Line OK
RF Remote sense error
CF Charger error
CL Current limit

Adjusting of 300W power board

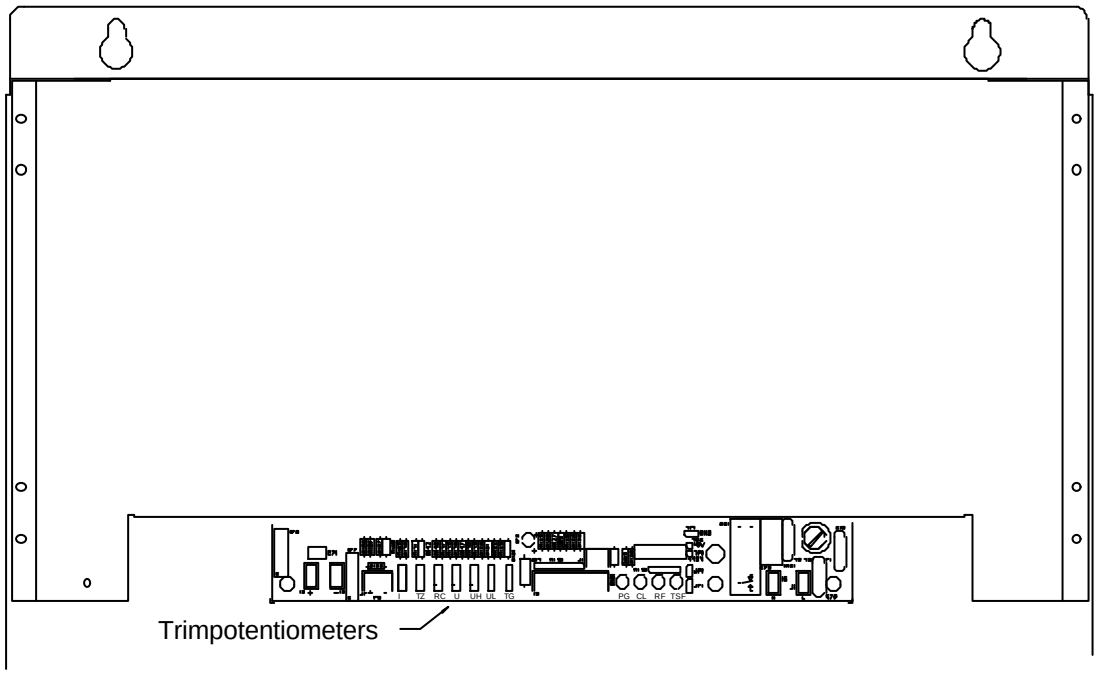
Please observe that high voltages are present in the cabinet and on the rectifier PCB and strict caution must be observed during adjustment.

To gain access to the potentiometers on the power PCB the cover shall be removed. And the profile that holds the alarm and display PCB must be swivelled to the right. This can be done by removing the 2 M4 screws in the top and bottom left corners on the profile, see fig below. Than the profile can be swivelled.



The load and the battery shall also be disconnected prior to the adjusting. Please also note that these adjustments only affect the rectifier and that the alarm card also might need adjustment if the charge level is changed.

Now the 7 potentiometers on the power board are easily accessible (see fig below).



Document 11604/11605 (depending of the units system voltage) shall be available during the adjustment procedure. This is because **only** voltage levels available in this document can be used without having alarms. OBSERVE that if the charging voltage is changed to correspond to a new row in this document, then the alarm board has to be changed accordingly to this new value.

If the output voltage is measured in the 4-mm panel sockets, make sure the voltmeter has an input impedance off at least 10Mohm.

Tip: When adjusting the rectifier's output voltage, a better accuracy can be achieved on the display by putting SW8: 8 in ON position, see also "Adjusting alarm board" in this documentation.

OBSERVE: The values that normally may have to be adjusted are Float voltage "U", High rate charge voltage "H" and Battery circuit alarm test level "L". The rest of the potentiometers shall normally not be adjusted.

Float voltage "U"

Potentiometer "**U**" shall be adjusted so that the output voltage correspond to the selected alarm level,
(32 selectable values are available on the alarm, and those are chosen by **SW5** and **SW7:1**). See also "Adjusting alarm board" in this documentation.
During this adjustment the switch **SW7:7** (temperate controlled charge level) shall be in OFF position (left). After the adjustment, do not forget to set **SW7:7** in its original position if the switch setting was altered during the adjustment procedure.

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High rate charge level "UH"

To adjust this level the charger shall be put in high rate charging mode with the push button on the front panel. That the charger is operating at high rate is indicated by that the yellow led beside this switch is on. (To be able to put the charger in high rate mode **SW6** (alarm board) must be in a position other than 0 and **SW8: 2** in **ON** (right) position.
Now adjust the chargers output voltage with **UH** to the desired level and then return **SW6** and **SW8: 2** to there original positions if these switches were changed prior to the adjustment.
OBSERVE: High rate level must as usual correspond to the values listed on the document describing possible charging levels (11604/11605).

Battery circuit test level "UL"

This is used for Battery circuit failure alarm. To adjust this level the charger must be put at battery circuit test voltage level. This is done by setting **SW8:7** (on the alarm board) in ON (right) position (simulates battery circuit test).
Then adjust the output voltage by means of **UL** to get it to **0,852** x normal charge level.
Example: 24V system 12 cells and 2.27V/cell have a normal charge level of 27.24V. So with **SW8:7** in ON position the output voltage shall be adjusted to
27.24V x 0.852=23.21V. Reset **SW8:7** to OFF after the adjustment is done.

Temperature compensation "TG"

12 Volts system. Factory set to give a charge level variation of ±**0.396V** at a temperature variation of 20 degrees around the temperature compensation zero point.
24 Volts system. Factory set to give a charge level variation of ±**0.792V** at a temperature variation of 20 degrees around the temperature compensation zero point.

The adjustment is done as to achieve these voltage variations.
Set **SW8:6** on the alarm board in ON position (this simulates a temperature rise of 20ºC).
Now adjust potentiometer **TG** on the control board as to get an output voltage reduction corresponding to the value stated above for the system voltage in question.
Example: 24 Volts-system, normal cell voltage 2.27V and 12 cells gives normal output voltage 27.24V. So in this case adjust **TG** to get 27.24V-0.396V=26.84V.
Remember to set **SW8:6** on the alarm board in OFF position after this adjustment is done.

Adjustment of remote sense "RC"

Factory pre-set and **not** to be adjusted.

Zero adjustment for temperature compensation "TZ"

Zero point adjusted to +**20°C**.
Factory pre-set and **not** to be adjusted by customer.

Adjustment of current "I"

Factory pre-set to 102**% ±2%** of the charger maximum current and shall **not** be adjusted.
A yellow led **CL** indicates when the charger is operating at current limit.

LED: PG Line OK
CL Current limit
RF Remote sense error
TSF Temperature sensor error

Adjustment of alarm PCB

Warning!

The components on the alarm PCB are connected to the negative terminal of the battery. This means that these components in the worst case can be at 270V with respect to the units metal parts (chassis). (This happens in a 220V unit that has a positive ground fault or with the batteries positive terminal grounded.) All adjustments shall be made with care and INSULATED tools MUST be used!

The switches themselves are insulated, but care must be taken not to touch any other components on the board.

Adjustments on the alarm are made by means of switches that are located to the left of the front panel itself. These switches are only accessible when the door of the cabinet is open. The following description is made from top to bottom of these switches. Se also page 6 in this instruction.

Delay A- and B-alarm

The time delay can be selected by turning **SW1 (A-alarm)** and **SW2 (B-alarm).** These switches are located in the top of the cut out.

	Delay	
Pos.	SW1 A-alarm (sec)	SW2 B-alarm (min)
0	10	0.5
1	20	1
2	30	1.5
3	40	2
4	50	2.5
5	60	3
6	70	3.5
7	80	4
8	90	4.5
9	100	5
A	110	5.5
B	120	6
C	130	6.5
D	140	7
E	180	15
F	300	30

All alarms except ground fault are connected to A-alarm. Ground fault + and - are connected to B-alarm. Both A-, and B-alarm controls Sum-alarm.

High rate charging time

High rate charging time can be adjusted with SW6. This switch can be found in the middle of the cut out.

SW6 Pos.	High rate charging time (h)
0	High rate disabled
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
A	10
B	11
C	12
D	13
E	14
F	15

Blocking of individual alarms.

Individual alarms can be blocked with SW3 and SW4. SW3 blocks alarms that are in the left column on the front panel, and SW4 blocks the alarms in the right column, from top to bottom. If any off the positions of this switch are in OFF position (left position) the corresponding alarm is blocked and an alarm condition is not shown on the front panel LED. If any individual alarm is blocked, this is indicated on the yellow LED in-between SW4 and SW5 and also the yellow led on the front panel associated to the individual alarms that, are blocked, are lit. For those types off units that has current (power) indication in % in the right column, SW4 has no meaning.

Adjustment of alarm levels voltage alarms:

SW5 and also pos. 1 on dipswitch SW7 determine the charge voltage level. Se also placement drawing on page 6 of this documentation.

Please observe that this adjustment only affects the alarm card and not the actual voltage level that the charger is providing. This level has to be adjusted on the charger card itself (for further information, please refer to the adjustment instruction for the power board also found in this documentation.)

Floating voltage error

This level can be chosen to be either ±1% or ±2% of the float charge voltage by means of SW7 pos. 3. At high rate charging these levels always is ±2% of the high rate charging level.

Low battery voltage, alarm level U<<
Fixed to 0.87 x float voltage level.

High battery voltage, alarm level U>>
Fixed to 1.04 x float voltage level or at high rate1.04 x high rate voltage level.

Sensitivity of ground fault alarm
The minimum permitted ground fault resistance not getting an alarm (250k or 500k ohm) is set by SW7 position 4.

Inhibit of ground fault alarm
Selected with SW7 position 5. If this switch is in ON position the ground fault alarm is inhibited. The measuring circuit itself though, is still connected to ground. If this also shall be opened up, the small jumper below the ”U/I/kÙ” button just outside the front panel must be removed.

Inhibit of battery circuit test
Controlled by SW7 pos. 6. When this switch is in OFF position a battery circuit test is performed once every 24h. At the test the reference for the chargers output voltage is lowered (to 0.852 x normal charging voltage) and at the same time, the alarm card measures the output voltage from the rectifier. If this measured voltage is equal to the reference value then there is something wrong in the battery circuit. If everything is OK the battery shall under this test supply the load with current and then keep the output voltage high. The value that the output voltage can fall to without giving an alarm is 0.8744 x normal charging voltage. This test takes less than 5 sec.
If SW7 pos. 6 is in ON position this test is inhibited (not done).

Activation of temperature compensation of float charge level.
With dipswitch SW7 position 7 the temperature compensation of the float charging voltage level can be activated. In position ON the charging voltage level will be adjusted in accordance to the batteries temperature. The alarm level for floating voltage error will track the charge voltage so that no alarm will occur because of this temperature compensation of the charge voltage. The alarm levels for over and under voltage will not track this compensation and therefore remain fixed. At high rate charging there is no compensation of the charging level due to battery temperature.

Automatic reset
By SW5 position 8 automatic reset of alarm relays at alarm disappearance can be chosen. Automatic reset means that if the alarm condition existed so long time that the alarm relay was deactivated, that relay will be automatically activated (reset) when the alarm condition no longer exists. The LED on the front panel for this alarm will though not be extinguished. From this it follows that it is possible to se on the front panel, which alarms that, occurred. These LED are reset as normal with the Reset push button on the front panel.

Automatic start of high rate charging after a line interruption, SW8: 1.
If SW8 pos 1 are in On position, then after a line interruption, the alarm processor monitors if the charger operates in current limit. If this is the case, then the time in current limit is measured. If this time exceeds 45 sec then a high rate charging cycle is initiated. This is indicated in the front panel by the yellow led next to the high rate pushbutton,

which is turned on. But the charging level is not yet increased and the time measurement is not started. This happens first when the charger has increased the battery voltage so much that the charger leaves current limit, then the charge level is increased and the timer is started. Now the charger operates at high rate charging level until the selected high rate charging time has passed, when the charger returns to float mode. If high rate charging has been automatically started it can be terminated by momentarily pushing the front panel high rate pushbutton.

Preventing manual start of high rate charging, SW8: 2.
If this switch is in OFF position high rate charging can not be initiated by the pushbutton on the front panel. If however high rate charging has been automatically started (after line interruption) this high rate cycle can be stopped by the front panel pushbutton.

Blocking of current display, SW8: 3.
With this switch the display of charger output current on the front panel can be blocked.

Operation time for battery room fan, SW8: 4.
At the same time as a high rate charging cycle is started, the relay (option) for controlling a fan in the battery room is activated. This relay is also activated some time after the high rate charge cycle is ended, to enable the gas form the batteries to be safely evacuated. This extra time can be selected between 2 different times by this switch.

The following switch positions are mainly for servicing and when adjustments are done on the rectifier. When any of the following switches are in ON position the green OK led is extinguished and the red “!” led is turned on. This is due to prevent any of these switches to be left in ON position by mistake after servicing the unit.

Show alarm levels, SW8: 5.
When this switch is in ON position the display shows the different alarm levels that are currently active. With the ”U/I/kÙ” button the different alarm levels are cycled through. The order that the alarm levels are shown in is as follows:

Under voltage
Battery circuit alarm level
Float voltage under 1%
Float voltage over 1%
Float voltage under 2%
Float voltage over 2%
Over voltage normal operation (float)
Shut off normal (float) operation (the rectifier is shut off if the output voltage exceeds this value).
High rate under voltage 2%
High rate over voltage 2%
Over voltage at high rate charging
Shut off high rate operation (the rectifier is shut off if the output voltage exceeds this value).
Battery disconnect (Option) (Used to prevent a deep discharge of the battery.)

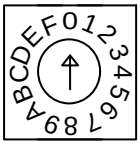
Calibration of temperature controlled charging voltage on the power board, SW8: 6.
If this switch is ON the alarm board gives a control signal to the power board that is equivalent to a battery temperature of +40 ºC. This function is utilised to check that the charger changes its output voltage correctly in accordance with the battery temperature.

Test of battery circuit test level, SW8: 7.
If this switch is in ON position the alarm board gives a command to the power board to set the output voltage to battery circuit test level, so this level easily can be check. (0.852 x float charge level).

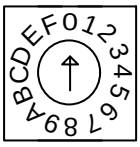
Calibration alarm board, SW8: 8.
Used mainly in production end test to calibrate the alarm board. If this switch is in ON position, the display is shifted one step to the left so that you can se 2 decimals on output voltage and current. If the leftmost position is a zero, this zero is suppressed which can give a confusing reading, if the output voltage is between 100-109 or 200-209. What measurement value that is shown on the display is as usual controlled by the ”U/I/kÙ” button. But in the position kohm + and kohm – the ground fault resistance is not displayed, but instead the output voltage from the charger prior to the output fuses. In U position, as usual, the chargers output voltage measured at the remote sense input terminals is displayed. If the output voltage from the rectifier is going to be adjusted, this function can be used to get a more accurate reading of the output voltage. In this case the pos. “U” shall be used, as the charger normally regulates on the voltage on the remote sense terminals.
This switch does not effect the “OK” and “!” LED’s, as (if switch is ON) the rectifier operates as normal however the display gives a reading with 2 decimals instead of one as usual is the case, and that there are no display of ground fault resistance.

Spec:
Display of current without decimals.
Used for big rectifiers, when a display of the output with decimals is unnecessary. Activated by closing JP8. (Situated on the backside of the alarm board itself. Accessible after the metal profile that holds the alarm board is swivelled out. OBSERVE Disconnect ALL voltages before JP8 is touched, as this switch is NOT isolated.)

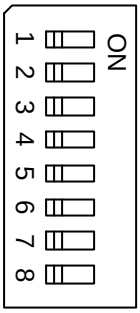
Short instruction for switches on alarm board



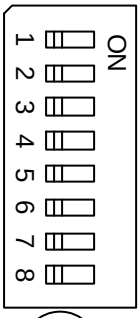
SW1
Delay A-alarm 10 sec/step. Step 0 gives 10 sec delay.



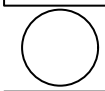
SW2
Delay A-alarm 30 sec/step. Step 0 gives 30 sec delay.



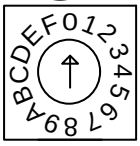
SW3
Blocking of individual alarms in the left column, from top to bottom. ON (right) position makes the alarms active, and OFF (left) position inhibits the corresponding alarm. If any individual alarm is blocked, this is indicated on the yellow LED in-between SW4 and SW5 and also on the yellow led on the front panel associated to the individual alarms that are blocked.



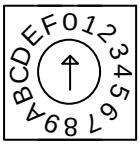
SW4
Blocking of individual alarms in the right column, from top to bottom. ON (right) position makes the alarms active, and OFF (left) position inhibits the corresponding alarm. If any individual alarm is blocked, this is indicated on the yellow LED in-between SW4 and SW5 and also, the yellow led on the front panel associated to the individual alarms that are block is lit. For those types off units that has current (power) indication in % in the right column SW4 has no meaning.



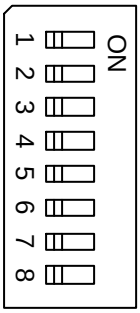
Yellow LED. On when any individual alarm is blocked.



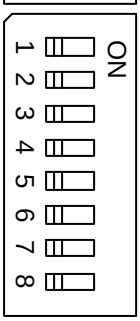
SW5
Selects charging voltage levels. (see 11604/11605/11606/11607/11608 depending on system voltage)



SW6
High rate charging time 60 min/step. Step 0 totally disables high rate charging..



SW7:
Pos. 1 Selection between Lead acid / NiCd alarm levels. (Lead acid=OFF / NiCd=ON)
Pos. 2 not used.
Pos. 3 Off: +/- 1% on float voltage alarm, ON: +/- 2% on float voltage alarms.
Pos. 4 Sensitivity ground fault alarm: Off: 500k On: 250k
Pos. 5 Inhibit ground fault alarm when ON.
Pos. 6 Inhibit battery circuit test when ON.
Pos. 7 On (right) position activates temperature controlled charging level.
Pos. 8 Auto Reset of alarms when ON (right position).



SW8:
Pos. 1: On (right position) turns on automatic start of high rate charging after an line interruption.
Pos. 2 Manual start of high rate charging is possible if switch ON (right position).
Pos. 3 Current display inhibited if ON
Pos. 4 Additional operation time for battery room fan. OFF=30min ON=2tim.
Pos. 5 For service: Display of alarm levels on display if ON
Pos. 6 For service: Simulate +40 º battery temp for calibration for temperature controlled charge level if ON
Pos. 7 For service: Test of battery circuit test voltage level if ON
Pos. 8 For service: Calibration mode if ON

Adjustment of display reading.

The user shall not do calibration of current and voltage readings, (which also affects the voltage alarms).

All measurements are done with 4½ digit resolution (>14 bits).
That accuracy is hard to get in the field, why this calibration is not recommended to do by the user. The adjustment is made on 5 trim potentiometers that are accessible through a hole under the display.
DO NOT ADJUST THESE POTENTIOMETERS!

12V		No off	Cell	High rate	Float	High rate	Under vol	BCT	Float u 1%	Float o 1%	Float u 2%	Float o 2%	Over volt	Shut off	High u 2%	High o 2%	O vo High	Shut off o	Shut off u
		cells	voltage	voltage	voltage		0,870	0,874	0,990	1,010	0,980	1,020	1,040	105%*F	98%*H	102%*H	104%*H	105%*H	0,800
Dip SW7	SW5:Pos																		
Pos 1=0FF	0	6	2,27	2,35	13,620	14,100	11,849	11,904	13,484	13,756	13,348	13,892	14,165	14,301	13,818	14,382	14,664	14,805	10,896
	1	6	2,24	2,35	13,440	14,100	11,693	11,747	13,306	13,574	13,171	13,709	13,978	14,112	13,818	14,382	14,664	14,805	10,752
	2	6	2,23	2,35	13,380	14,100	11,641	11,694	13,246	13,514	13,112	13,648	13,915	14,049	13,818	14,382	14,664	14,805	10,704
	3	6	2,28	2,35	13,680	14,100	11,902	11,956	13,543	13,817	13,406	13,954	14,227	14,364	13,818	14,382	14,664	14,805	10,944
	4	6	2,30	2,35	13,800	14,100	12,006	12,061	13,662	13,938	13,524	14,076	14,352	14,490	13,818	14,382	14,664	14,805	11,040
	5	6	2,27	2,35	13,620	14,100	11,849	11,904	13,484	13,756	13,348	13,892	14,165	14,301	13,818	14,382	14,664	14,805	10,896
	6	6	2,24	2,35	13,440	14,100	11,693	11,747	13,306	13,574	13,171	13,709	13,978	14,112	13,818	14,382	14,664	14,805	10,752
	7	6	2,23	2,35	13,380	14,100	11,641	11,694	13,246	13,514	13,112	13,648	13,915	14,049	13,818	14,382	14,664	14,805	10,704
	8	6	2,28	2,35	13,680	14,100	11,902	11,956	13,543	13,817	13,406	13,954	14,227	14,364	13,818	14,382	14,664	14,805	10,944
	9	6	2,30	2,35	13,800	14,100	12,006	12,061	13,662	13,938	13,524	14,076	14,352	14,490	13,818	14,382	14,664	14,805	11,040
	A	6	2,23	2,35	13,380	14,100	11,641	11,694	13,246	13,514	13,112	13,648	13,915	14,049	13,818	14,382	14,664	14,805	10,704
	B	6	2,27	2,35	13,620	14,100	11,849	11,904	13,484	13,756	13,348	13,892	14,165	14,301	13,818	14,382	14,664	14,805	10,896
	C	6	2,28	2,35	13,680	14,100	11,902	11,956	13,543	13,817	13,406	13,954	14,227	14,364	13,818	14,382	14,664	14,805	10,944
	D	6	2,24	2,35	13,440	14,100	11,693	11,747	13,306	13,574	13,171	13,709	13,978	14,112	13,818	14,382	14,664	14,805	10,752
Cust. Spec.	E																		
	F	6	2,00	2,00	12,000	12,000	10,440	10,488	11,880	12,120	11,760	12,240	12,480	12,600	11,760	12,240	12,480	12,600	9,600
Dip SW7	SW5:Pos																		
Pos 0=ON	0	10	1,41	1,55	14,100	15,500	12,267	12,323	13,959	14,241	13,818	14,382	14,664	14,805	15,190	15,810	16,120	16,275	11,280
	1	10	1,41	1,50	14,100	15,000	12,267	12,323	13,959	14,241	13,818	14,382	14,664	14,805	14,700	15,300	15,600	15,750	11,280
	2	10	1,37	1,45	13,700	14,500	11,919	11,974	13,563	13,837	13,426	13,974	14,248	14,385	14,210	14,790	15,080	15,225	10,960
	3	10	1,43	1,55	14,300	15,500	12,441	12,498	14,157	14,443	14,014	14,586	14,872	15,015	15,190	15,810	16,120	16,275	11,440
	4	10	1,45	1,55	14,500	15,500	12,615	12,673	14,355	14,645	14,210	14,790	15,080	15,225	15,190	15,810	16,120	16,275	11,600
	5	10	1,37	1,45	13,700	14,500	11,919	11,974	13,563	13,837	13,426	13,974	14,248	14,385	14,210	14,790	15,080	15,225	10,960
	6	9	1,41	1,50	12,690	13,500	11,040	11,091	12,563	12,817	12,436	12,944	13,198	13,325	13,230	13,770	14,040	14,175	10,152
	7	9	1,41	1,55	12,690	13,950	11,040	11,091	12,563	12,817	12,436	12,944	13,198	13,325	13,671	14,229	14,508	14,648	10,152
	8	9	1,42	1,55	12,780	13,950	11,119	11,170	12,652	12,908	12,524	13,036	13,291	13,419	13,671	14,229	14,508	14,648	10,224
	9	9	1,43	1,55	12,870	13,950	11,197	11,248	12,741	12,999	12,613	13,127	13,385	13,514	13,671	14,229	14,508	14,648	10,296
	A	9	1,45	1,55	13,050	13,950	11,354	11,406	12,920	13,181	12,789	13,311	13,572	13,703	13,671	14,229	14,508	14,648	10,440
	B	11	1,41	1,50	15,510	16,500	13,494	13,556	15,355	15,665	15,200	15,820	16,130	16,286	16,170	16,830	17,160	17,325	12,408
	C	11	1,42	1,55	15,620	17,050	13,589	13,652	15,464	15,776	15,308	15,932	16,245	16,401	16,709	17,391	17,732	17,903	12,496
	D	11	1,43	1,55	15,730	17,050	13,685	13,748	15,573	15,887	15,415	16,045	16,359	16,517	16,709	17,391	17,732	17,903	12,584
	E	11	1,42	1,55	15,620	17,050	13,589	13,652	15,464	15,776	15,308	15,932	16,245	16,401	16,709	17,391	17,732	17,903	12,496
	F	11	1,40	1,55	15,400	17,050	13,398	13,460	15,246	15,554	15,092	15,708	16,016	16,170	16,709	17,391	17,732	17,903	12,320

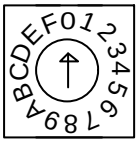
24V		No off	Cell	High rate	Float	High rate	Under vol	BCT	Float u 1%	Float o 1%	Float u 2%	Float o 2%	Over volt	Shut off	High u 2%	High o 2%	O vo High	Shut off o	Shut off u
		cells	voltage	voltage	voltage		0,870	0,874	0,990	1,010	0,980	1,020	1,040	105%*F	98%*H	102%*H	104%*H	105%*H	0,800
Dip SW7	SW5:Pos																		
Pos 1=0FF	0	12	2,27	2,35	27,240	28,200	23,699	23,808	26,968	27,512	26,695	27,785	28,330	28,602	27,636	28,764	29,328	29,610	21,792
	1	12	2,24	2,35	26,880	28,200	23,386	23,493	26,611	27,149	26,342	27,418	27,955	28,224	27,636	28,764	29,328	29,610	21,504
	2	12	2,23	2,35	26,760	28,200	23,281	23,388	26,492	27,028	26,225	27,295	27,830	28,098	27,636	28,764	29,328	29,610	21,408
	3	12	2,28	2,35	27,360	28,200	23,803	23,913	27,086	27,634	26,813	27,907	28,454	28,728	27,636	28,764	29,328	29,610	21,888
	4	12	2,30	2,35	27,600	28,200	24,012	24,122	27,324	27,876	27,048	28,152	28,704	28,980	27,636	28,764	29,328	29,610	22,080
	5	11	2,27	2,35	24,970	25,850	21,724	21,824	24,720	25,220	24,471	25,469	25,969	26,219	25,333	26,367	26,884	27,143	19,976
	6	11	2,24	2,35	24,640	25,850	21,437	21,535	24,394	24,886	24,147	25,133	25,626	25,872	25,333	26,367	26,884	27,143	19,712
	7	11	2,23	2,35	24,530	25,850	21,341	21,439	24,285	24,775	24,039	25,021	25,511	25,757	25,333	26,367	26,884	27,143	19,624
	8	11	2,28	2,35	25,080	25,850	21,820	21,920	24,829	25,331	24,578	25,582	26,083	26,334	25,333	26,367	26,884	27,143	20,064
	9	11	2,30	2,35	25,300	25,850	22,011	22,112	25,047	25,553	24,794	25,806	26,312	26,565	25,333	26,367	26,884	27,143	20,240
	A	12	2,23	2,35	26,760	28,200	23,281	23,388	26,492	27,028	26,225	27,295	27,830	28,098	27,636	28,764	29,328	29,610	21,408
	B	12	2,27	2,35	27,240	28,200	23,699	23,808	26,968	27,512	26,695	27,785	28,330	28,602	27,636	28,764	29,328	29,610	21,792
	C	11	2,28	2,35	25,080	25,850	21,820	21,920	24,829	25,331	24,578	25,582	26,083	26,334	25,333	26,367	26,884	27,143	20,064
	D	11	2,24	2,35	24,640	25,850	21,437	21,535	24,394	24,886	24,147	25,133	25,626	25,872	25,333	26,367	26,884	27,143	19,712
Cust. Spec.	E																		
	F	12	2,00	2,00	24,000	24,000	20,880	20,976	23,760	24,240	23,520	24,480	24,960	25,200	23,520	24,480	24,960	25,200	19,200
Dip SW7	SW5:Pos																		
Pos 0=ON	0	20	1,41	1,55	28,200	31,000	24,534	24,647	27,918	28,482	27,636	28,764	29,328	29,610	30,380	31,620	32,240	32,550	22,560
	1	20	1,41	1,50	28,200	30,000	24,534	24,647	27,918	28,482	27,636	28,764	29,328	29,610	29,400	30,600	31,200	31,500	22,560
	2	20	1,40	1,50	28,000	30,000	24,360	24,472	27,720	28,280	27,440	28,560	29,120	29,400	29,400	30,600	31,200	31,500	22,400
	3	20	1,43	1,55	28,600	31,000	24,882	24,996	28,314	28,886	28,028	29,172	29,744	30,030	30,380	31,620	32,240	32,550	22,880
	4	20	1,45	1,55	29,000	31,000	25,230	25,346	28,710	29,290	28,420	29,580	30,160	30,450	30,380	31,620	32,240	32,550	23,200
	5	20	1,37	1,45	27,400	29,000	23,838	23,948	27,126	27,674	26,852	27,948	28,496	28,770	28,420	29,580	30,160	30,450	21,920
	6	19	1,41	1,50	26,790	28,500	23,307	23,414	26,522	27,058	26,254	27,326	27,862	28,130	27,930	29,070	29,640	29,925	21,432
	7	19	1,41	1,55	26,790	29,450	23,307	23,414	26,522	27,058	26,254	27,326	27,862	28,130	28,861	30,039	30,628	30,923	21,432
	8	19	1,42	1,55	26,980	29,450	23,473	23,581	26,710	27,250	26,440	27,520	28,059	28,329	28,861	30,039	30,628	30,923	21,584
	9	19	1,43	1,55	27,170	29,450	23,638	23,747	26,898	27,442	26,627	27,713	28,257	28,529	28,861	30,039	30,628	30,923	21,736
	A	19	1,45	1,55	27,550	29,450	23,969	24,079	27,275	27,826	26,999	28,101	28,652	28,928	28,861	30,039	30,628	30,923	22,040
	B	18	1,41	1,50	25,380	27,000	22,081	22,182	25,126	25,634	24,872	25,888	26,395	26,649	26,460	27,540	28,080	28,350	20,304
	C	18	1,41	1,55	25,380	27,900	22,081	22,182	25,126	25,634	24,872	25,888	26,395	26,649	27,342	28,458	29,016	29,295	20,304
	D	18	1,42	1,55	25,560	27,900	22,237	22,339	25,304	25,816	25,049	26,071	26,582	26,838	27,342	28,458	29,016	29,295	20,448
	E	18	1,43	1,55	25,740	27,900	22,394	22,497	25,483	25,997	25,225	26,255	26,770	27,027	27,342	28,458	29,016	29,295	20,592
	F	18	1,45	1,55	26,100	27,900	22,707	22,811	25,839	26,361	25,578	26,622	27,144	27,405	27,342	28,458	29,016	29,295	20,880

48V		No off	Cell	High rate	Float	High rate	Under vol	BCT	Float u 1%	Float o 1%	Float u 2%	Float o 2%	Over volt	Shut off	High u 2%	High o 2%	O vo High	Shut off o	Shut off u
		cells	voltage	voltage	voltage		0,870	0,874	0,990	1,010	0,980	1,020	1,040	105%*F	98%*H	102%*H	104%*H	105%*H	0,800
Dip SW7	SW5:Pos																		
Pos 1=0FF	0	24	2,27	2,35	54,480	56,400	47,398	47,616	53,935	55,025	53,390	55,570	56,659	57,204	55,272	57,528	58,656	59,220	43,584
	1	24	2,24	2,35	53,760	56,400	46,771	46,986	53,222	54,298	52,685	54,835	55,910	56,448	55,272	57,528	58,656	59,220	43,008
	2	24	2,23	2,35	53,520	56,400	46,562	46,776	52,985	54,055	52,450	54,590	55,661	56,196	55,272	57,528	58,656	59,220	42,816
	3	24	2,28	2,35	54,720	56,400	47,606	47,825	54,173	55,267	53,626	55,814	56,909	57,456	55,272	57,528	58,656	59,220	43,776
	4	24	2,30	2,35	55,200	56,400	48,024	48,245	54,648	55,752	54,096	56,304	57,408	57,960	55,272	57,528	58,656	59,220	44,160
	5	23	2,27	2,35	52,210	54,050	45,423	45,632	51,688	52,732	51,166	53,254	54,298	54,821	52,969	55,131	56,212	56,753	41,768
	6	23	2,24	2,35	51,520	54,050	44,822	45,028	51,005	52,035	50,490	52,550	53,581	54,096	52,969	55,131	56,212	56,753	41,216
	7	23	2,23	2,35	51,290	54,050	44,622	44,827	50,777	51,803	50,264	52,316	53,342	53,855	52,969	55,131	56,212	56,753	41,032
	8	23	2,28	2,35	52,440	54,050	45,623	45,833	51,916	52,964	51,391	53,489	54,538	55,062	52,969	55,131	56,212	56,753	41,952
	9	23	2,30	2,35	52,900	54,050	46,023	46,235	52,371	53,429	51,842	53,958	55,016	55,545	52,969	55,131	56,212	56,753	42,320
	A	23	2,29	2,35	52,670	54,050	45,823	46,034	52,143	53,197	51,617	53,723	54,777	55,304	52,969	55,131	56,212	56,753	42,136
	B	22	2,23	2,35	49,060	51,700	42,682	42,878	48,569	49,551	48,079	50,041	51,022	51,513	50,666	52,734	53,768	54,285	39,248
	C	22	2,27	2,35	49,940	51,700	43,448	43,648	49,441	50,439	48,941	50,939	51,938	52,437	50,666	52,734	53,768	54,285	39,952
	D	22	2,29	2,35	50,380	51,700	43,831	44,032	49,876	50,884	49,372	51,388	52,395	52,899	50,666	52,734	53,768	54,285	40,304
Cust. Spec.	E																		
	F	24	2,00	2,00	48,000	48,000	41,760	41,952	47,520	48,480	47,040	48,960	49,920	50,400	47,040	48,960	49,920	50,400	38,400
Dip SW7	SW5:Pos																		
Pos 0=ON	0	40	1,41	1,55	56,400	62,000	49,068	49,294	55,836	56,964	55,272	57,528	58,656	59,220	60,760	63,240	64,480	65,100	45,120
	1	40	1,41	1,50	56,400	60,000	49,068	49,294	55,836	56,964	55,272	57,528	58,656	59,220	58,800	61,200	62,400	63,000	45,120
	2	40	1,37	1,45	54,800	58,000	47,676	47,895	54,252	55,348	53,704	55,896	56,992	57,540	56,840	59,160	60,320	60,900	43,840
	3	40	1,43	1,55	57,200	62,000	49,764	49,993	56,628	57,772	56,056	58,344	59,488	60,060	60,760	63,240	64,480	65,100	45,760
	4	40	1,45	1,55	58,000	62,000	50,460	50,692	57,420	58,580	56,840	59,160	60,320	60,900	60,760	63,240	64,480	65,100	46,400
	5	39	1,37	1,45	53,430	56,550	46,484	46,698	52,896	53,964	52,361	54,499	55,567	56,102	55,419	57,681	58,812	59,378	42,744
	6	39	1,41	1,50	54,990	58,500	47,841	48,061	54,440	55,540	53,890	56,090	57,190	57,740	57,330	59,670	60,840	61,425	43,992
	7	39	1,41	1,55	54,990	60,450	47,841	48,061	54,440	55,540	53,890	56,090	57,190	57,740	59,241	61,659	62,868	63,473	43,992
	8	39	1,42	1,55	55,380	60,450	48,181	48,402	54,826	55,934	54,272	56,488	57,595	58,149	59,241	61,659	62,868	63,473	44,304
	9	39	1,43	1,55	55,770	60,450	48,520	48,743	55,212	56,328	54,655	56,885	58,001	58,559	59,241	61,659	62,868	63,473	44,616
	A	39	1,45	1,55	56,550	60,450	49,199	49,425	55,985	57,116	55,419	57,681	58,812	59,378	59,241	61,659	62,868	63,473	45,240
	B	38	1,41	1,50	53,580	57,000	46,615	46,829	53,044	54,116	52,508	54,652	55,723	56,259	55,860	58,140	59,280	59,850	42,864
	C	38	1,41	1,55	53,580	58,900	46,615	46,829	53,044	54,116	52,508	54,652	55,723	56,259	57,722	60,078	61,256	61,845	42,864
	D	38	1,42	1,55	53,960	58,900	46,945	47,161	53,420	54,500	52,881	55,039	56,118	56,658	57,722	60,078	61,256	61,845	43,168
	E	38	1,41	1,55	53,580	58,900	46,615	46,829	53,044	54,116	52,508	54,652	55,723	56,259	57,722	60,078	61,256	61,845	42,864
	F	38	1,45	1,55	55,100	58,900	47,937	48,157	54,549	55,651	53,998	56,202	57,304	57,855	57,722	60,078	61,256	61,845	44,080

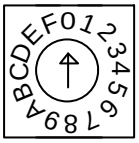
110V		No off	Cell	High rate	Float	High rate	Under vol	BCT	Float u 1%	Float o 1%	Float u 2%	Float o 2%	Over volt	Shut off	High u 2%	High o 2%	O vo High	Shut off o	Shut off u
		cells	voltage	voltage	voltage		0,870	0,874	0,990	1,010	0,980	1,020	1,040	105%*F	98%*H	102%*H	104%*H	105%*H	0,800
Dip SW7	SW5:Pos																		
Pos 1=0FF	0	54	2,27	2,35	122,580	126,900	106,645	107,135	121,354	123,806	120,128	125,032	127,483	128,709	124,362	129,438	131,976	133,245	98,064
	1	54	2,24	2,35	120,960	126,900	105,235	105,719	119,750	122,170	118,541	123,379	125,798	127,008	124,362	129,438	131,976	133,245	96,768
	2	54	2,23	2,35	120,420	126,900	104,765	105,247	119,216	121,624	118,012	122,828	125,237	126,441	124,362	129,438	131,976	133,245	96,336
	3	54	2,28	2,35	123,120	126,900	107,114	107,607	121,889	124,351	120,658	125,582	128,045	129,276	124,362	129,438	131,976	133,245	98,496
	4	54	2,30	2,35	124,200	126,900	108,054	108,551	122,958	125,442	121,716	126,684	129,168	130,410	124,362	129,438	131,976	133,245	99,360
	5	53	2,27	2,35	120,310	124,550	104,670	105,151	119,107	121,513	117,904	122,716	125,122	126,326	122,059	127,041	129,532	130,778	96,248
	6	53	2,24	2,35	118,720	124,550	103,286	103,761	117,533	119,907	116,346	121,094	123,469	124,656	122,059	127,041	129,532	130,778	94,976
	7	53	2,23	2,35	118,190	124,550	102,825	103,298	117,008	119,372	115,826	120,554	122,918	124,100	122,059	127,041	129,532	130,778	94,552
	8	53	2,28	2,35	120,840	124,550	105,131	105,614	119,632	122,048	118,423	123,257	125,674	126,882	122,059	127,041	129,532	130,778	96,672
	9	53	2,30	2,35	121,900	124,550	106,053	106,541	120,681	123,119	119,462	124,338	126,776	127,995	122,059	127,041	129,532	130,778	97,520
	A	52	2,23	2,35	115,960	122,200	100,885	101,349	114,800	117,120	113,641	118,279	120,598	121,758	119,756	124,644	127,088	128,310	92,768
	B	52	2,27	2,35	118,040	122,200	102,695	103,167	116,860	119,220	115,679	120,401	122,762	123,942	119,756	124,644	127,088	128,310	94,432
	C	52	2,24	2,35	116,480	122,200	101,338	101,804	115,315	117,645	114,150	118,810	121,139	122,304	119,756	124,644	127,088	128,310	93,184
	D	52	2,29	2,35	119,080	122,200	103,600	104,076	117,889	120,271	116,698	121,462	123,843	125,034	119,756	124,644	127,088	128,310	95,264
Cust. Spec.	E																		
	F	55	2,00	2,00	110,000	110,000	95,700	96,140	108,900	111,100	107,800	112,200	114,400	115,500	107,800	112,200	114,400	115,500	88,000
Dip SW7	SW5:Pos																		
Pos 0=ON	0	85	1,41	1,55	119,850	131,750	104,270	104,749	118,652	121,049	117,453	122,247	124,644	125,843	129,115	134,385	137,020	138,338	95,880
	1	85	1,41	1,50	119,850	127,500	104,270	104,749	118,652	121,049	117,453	122,247	124,644	125,843	124,950	130,050	132,600	133,875	95,880
	2	85	1,37	1,45	116,450	123,250	101,312	101,777	115,286	117,615	114,121	118,779	121,108	122,273	120,785	125,715	128,180	129,413	93,160
	3	85	1,43	1,55	121,550	131,750	105,749	106,235	120,335	122,766	119,119	123,981	126,412	127,628	129,115	134,385	137,020	138,338	97,240
	4	85	1,45	1,55	123,250	131,750	107,228	107,721	122,018	124,483	120,785	125,715	128,180	129,413	129,115	134,385	137,020	138,338	98,600
	5	85	1,37	1,45	116,450	123,250	101,312	101,777	115,286	117,615	114,121	118,779	121,108	122,273	120,785	125,715	128,180	129,413	93,160
	6	90	1,41	1,50	126,900	135,000	110,403	110,911	125,631	128,169	124,362	129,438	131,976	133,245	132,300	137,700	140,400	141,750	101,520
	7	90	1,41	1,55	126,900	139,500	110,403	110,911	125,631	128,169	124,362	129,438	131,976	133,245	136,710	142,290	145,080	146,475	101,520
	8	90	1,42	1,55	127,800	139,500	111,186	111,697	126,522	129,078	125,244	130,356	132,912	134,190	136,710	142,290	145,080	146,475	102,240
	9	90	1,43	1,55	128,700	139,500	111,969	112,484	127,413	129,987	126,126	131,274	133,848	135,135	136,710	142,290	145,080	146,475	102,960
	A	90	1,45	1,55	130,500	139,500	113,535	114,057	129,195	131,805	127,890	133,110	135,720	137,025	136,710	142,290	145,080	146,475	104,400
	B	90	1,41	1,50	126,900	135,000	110,403	110,911	125,631	128,169	124,362	129,438	131,976	133,245	132,300	137,700	140,400	141,750	101,520
	C	80	1,41	1,55	112,800	124,000	98,136	98,587	111,672	113,928	110,544	115,056	117,312	118,440	121,520	126,480	128,960	130,200	90,240
	D	80	1,42	1,55	113,600	124,000	98,832	99,286	112,464	114,736	111,328	115,872	118,144	119,280	121,520	126,480	128,960	130,200	90,880
	E	80	1,41	1,55	112,800	124,000	98,136	98,587	111,672	113,928	110,544	115,056	117,312	118,440	121,520	126,480	128,960	130,200	90,240
	F	80	1,45	1,55	116,000	124,000	100,920	101,384	114,840	117,160	113,680	118,320	120,640	121,800	121,520	126,480	128,960	130,200	92,800

220V		No off	Cell	High rate	Float	High rate	Under vol	BCT	Float u 1%	Float o 1%	Float u 2%	Float o 2%	Over volt	Shut off	High u 2%	High o 2%	O vo High	Shut off o	Shut off u
		cells	voltage	voltage	voltage		0,870	0,874	0,990	1,010	0,980	1,020	1,040	105%*F	98%*H	102%*H	104%*H	105%*H	0,800
Dip SW7	SW5:Pos																		
Pos 1=0FF	0	108	2,27	2,35	245,160	253,800	213,289	214,270	242,708	247,612	240,257	250,063	254,966	257,418	248,724	258,876	263,952	266,490	196,128
	1	108	2,24	2,35	241,920	253,800	210,470	211,438	239,501	244,339	237,082	246,758	251,597	254,016	248,724	258,876	263,952	266,490	193,536
	2	108	2,23	2,35	240,840	253,800	209,531	210,494	238,432	243,248	236,023	245,657	250,474	252,882	248,724	258,876	263,952	266,490	192,672
	3	108	2,28	2,35	246,240	253,800	214,229	215,214	243,778	248,702	241,315	251,165	256,090	258,552	248,724	258,876	263,952	266,490	196,992
	4	108	2,30	2,35	248,400	253,800	216,108	217,102	245,916	250,884	243,432	253,368	258,336	260,820	248,724	258,876	263,952	266,490	198,720
	5	106	2,27	2,35	240,620	249,100	209,339	210,302	238,214	243,026	235,808	245,432	250,245	252,651	244,118	254,082	259,064	261,555	192,496
	6	106	2,24	2,35	237,440	249,100	206,573	207,523	235,066	239,814	232,691	242,189	246,938	249,312	244,118	254,082	259,064	261,555	189,952
	7	106	2,23	2,35	236,380	249,100	205,651	206,596	234,016	238,744	231,652	241,108	245,835	248,199	244,118	254,082	259,064	261,555	189,104
	8	106	2,28	2,35	241,680	249,100	210,262	211,228	239,263	244,097	236,846	246,514	251,347	253,764	244,118	254,082	259,064	261,555	193,344
	9	106	2,30	2,35	243,800	249,100	212,106	213,081	241,362	246,238	238,924	248,676	253,552	255,990	244,118	254,082	259,064	261,555	195,040
	A	105	2,23	2,35	234,150	246,750	203,711	204,647	231,809	236,492	229,467	238,833	243,516	245,858	241,815	251,685	256,620	259,088	187,320
	B	105	2,27	2,35	238,350	246,750	207,365	208,318	235,967	240,734	233,583	243,117	247,884	250,268	241,815	251,685	256,620	259,088	190,680
	C	105	2,28	2,35	239,400	246,750	208,278	209,236	237,006	241,794	234,612	244,188	248,976	251,370	241,815	251,685	256,620	259,088	191,520
	D	105	2,24	2,35	235,200	246,750	204,624	205,565	232,848	237,552	230,496	239,904	244,608	246,960	241,815	251,685	256,620	259,088	188,160
Cust. Spec.	E																		
	F	110	2,00	2,00	220,000	220,000	191,400	192,280	217,800	222,200	215,600	224,400	228,800	231,000	215,600	224,400	228,800	231,000	176,000
Dip SW7	Pos SW5:																		
Pos 0=ON	0	178	1,41	1,55	250,980	275,900	218,353	219,357	248,470	253,490	245,960	256,000	261,019	263,529	270,382	281,418	286,936	289,695	200,784
	1	178	1,41	1,50	250,980	267,000	218,353	219,357	248,470	253,490	245,960	256,000	261,019	263,529	261,660	272,340	277,680	280,350	200,784
	2	178	1,37	1,45	243,860	258,100	212,158	213,134	241,421	246,299	238,983	248,737	253,614	256,053	252,938	263,262	268,424	271,005	195,088
	3	178	1,43	1,55	254,540	275,900	221,450	222,468	251,995	257,085	249,449	259,631	264,722	267,267	270,382	281,418	286,936	289,695	203,632
	4	178	1,45	1,55	258,100	275,900	224,547	225,579	255,519	260,681	252,938	263,262	268,424	271,005	270,382	281,418	286,936	289,695	206,480
	5	178	1,37	1,45	243,860	258,100	212,158	213,134	241,421	246,299	238,983	248,737	253,614	256,053	252,938	263,262	268,424	271,005	195,088
	6	174	1,41	1,50	245,340	261,000	213,446	214,427	242,887	247,793	240,433	250,247	255,154	257,607	255,780	266,220	271,440	274,050	196,272
	7	174	1,41	1,55	245,340	269,700	213,446	214,427	242,887	247,793	240,433	250,247	255,154	257,607	264,306	275,094	280,488	283,185	196,272
	8	174	1,42	1,55	247,080	269,700	214,960	215,948	244,609	249,551	242,138	252,022	256,963	259,434	264,306	275,094	280,488	283,185	197,664
	9	174	1,43	1,55	248,820	269,700	216,473	217,469	246,332	251,308	243,844	253,796	258,773	261,261	264,306	275,094	280,488	283,185	199,056
	A	174	1,45	1,55	252,300	269,700	219,501	220,510	249,777	254,823	247,254	257,346	262,392	264,915	264,306	275,094	280,488	283,185	201,840
	B	170	1,41	1,50	239,700	255,000	208,539	209,498	237,303	242,097	234,906	244,494	249,288	251,685	249,900	260,100	265,200	267,750	191,760
	C	170	1,41	1,55	239,700	263,500	208,539	209,498	237,303	242,097	234,906	244,494	249,288	251,685	258,230	268,770	274,040	276,675	191,760
	D	170	1,42	1,55	241,400	263,500	210,018	210,984	238,986	243,814	236,572	246,228	251,056	253,470	258,230	268,770	274,040	276,675	193,120
	E	170	1,45	1,55	246,500	263,500	214,455	215,441	244,035	248,965	241,570	251,430	256,360	258,825	258,230	268,770	274,040	276,675	197,200
	F	170	1,45	1,55	246,500	263,500	214,455	215,441	244,035	248,965	241,570	251,430	256,360	258,825	258,230	268,770	274,040	276,675	197,200

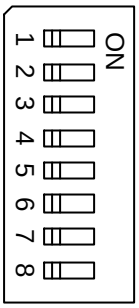
Factory settings.



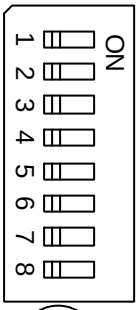
SW1
Delay A-alarm 10 sec = pos. 0



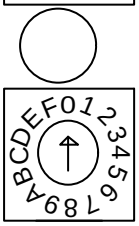
SW2
Delay B-alarm 30 sec = pos. 0.



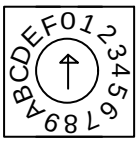
SW3
No individual alarm inhibited. (All ON)



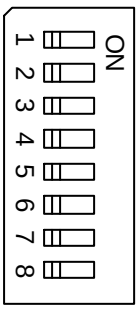
SW4
For versions with current (power) indication in % in the right column this switch has no function.



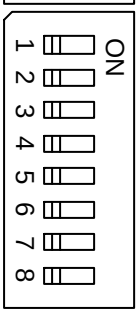
SW5
Float voltage. (see below)



SW6
High rate charge time 1h = pos. 1.



SW7:
Pos. 1 Lead acid / NiCd (see below). (Lead acid=OFF / NiCd=ON)
Pos. 2 Optional.
Pos. 3 +/- 1% float voltage alarm. (switch OFF)
Pos. 4 Sensitivity for ground fault alarm: 500k. (switch OFF)
Pos. 5 Ground fault alarm active. (switch OFF)
Pos. 6 Battery circuit test active (switch OFF)
Pos. 7 Temperature controlled charging voltage level disabled. (switch OFF)
Pos. 8 Not Auto Reset of alarms. (switch OFF)



SW8:
Pos. 1: Automatic start of high rate charge after long line interruption. (switch ON.)
Pos. 2 Manuel start of high rate charging cycle by front panel push button possible (switch ON).
Pos. 3 Current display on. (switch Off.)
Pos. 4 Extra operation time for battery room fan 30 min. (switch Off.)
Pos. 5 Off
Pos. 6 Off
Pos. 7 Off
Pos. 8 Off

This unit is configured for: …….Lead acid ……..NiCd

System voltage V

Float voltage level V

High rate voltage level V

Number of cells:

Float voltage V/cell

High rate voltage V/cell

Pos. SW5:

Pos. SW7:1

Signature:

Date: