Constant voltage 3-phase rectifier.

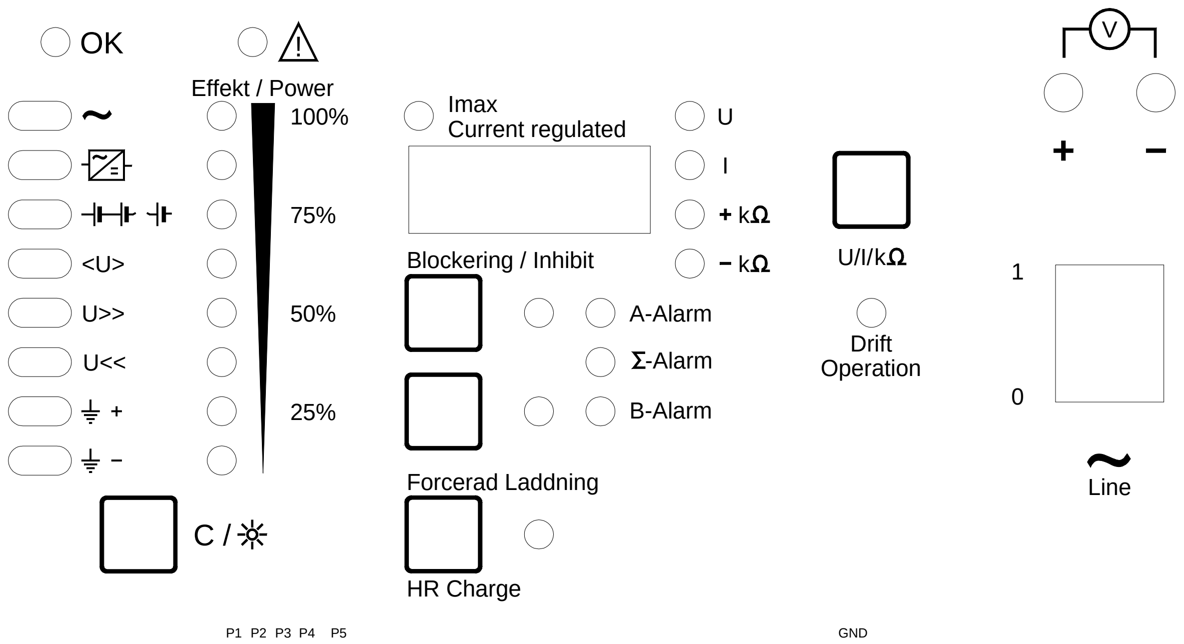
Mechanical assembly

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 4, 5 or 6 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. The terminals for **output** DC, are located to the left in 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.

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/kΩ**" 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/kΩ**" 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 output fuses are inserted.

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 **L1, L2, L3**, **N**, **GND** (Line1,2,3, Neutral and Protective Ground). If additional protective ground connection is wanted, this connection can 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-**.

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 inserted. As the battery probably is discharged, the charger goes into current limit a number of hours until the correct battery voltage is obtained.

Technical specification

Charger:

AC input voltage	400/230V +15% -15%, 3-phase 47 – 63 Hz
Power factor	Better than 0.98
DC output voltage	Nominal 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

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

<u>A-Alarm</u>	<u>B-Alarm</u>	<u>Sum-Alarm</u>
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.

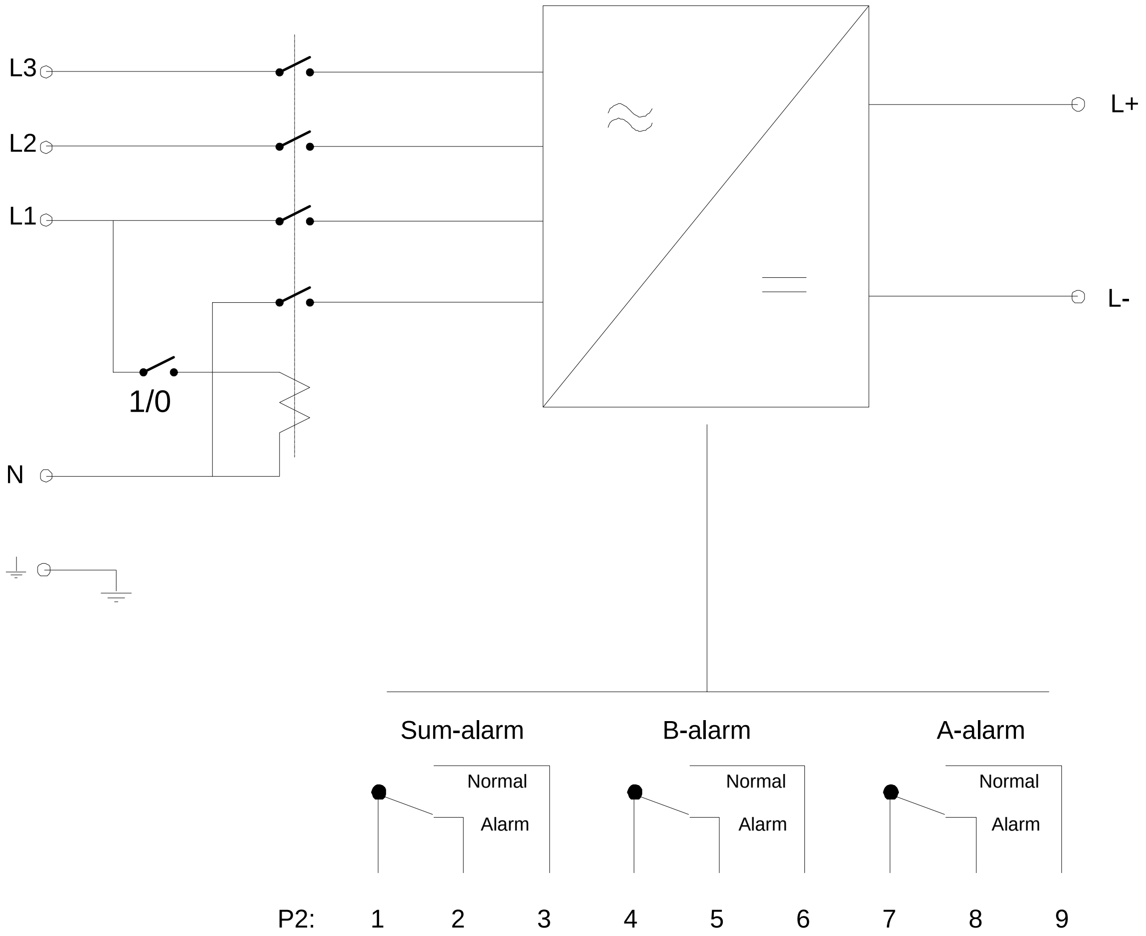
Option

External temperature sensor.

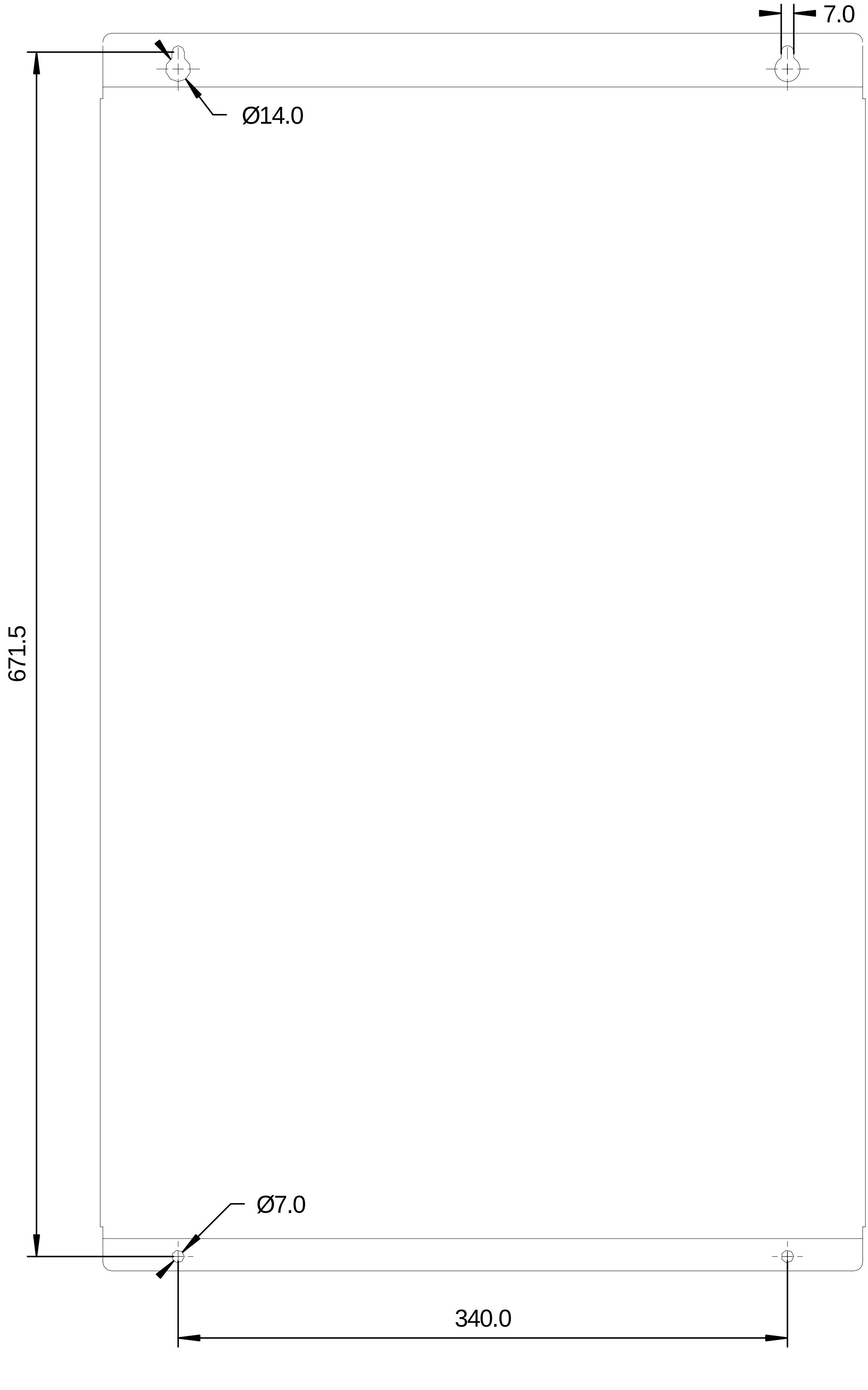
Please refer to the type label on the cabinets lower right side for information about the rectifiers output voltage and maximum current.

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

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.

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. SW3 blocks alarms that are in the left column on the front panel 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.

Selecting if A- or B-Alarm.
Individual alarms can be selected to belong to either A- or B-Alarm with SW4. SW4 controls alarms in the same order as they are in the left column on the front panel from top to bottom. If any position of this switch are in OFF position (left position) the corresponding alarm is selected to belong to A-Alarm group and if the switch is in the right position (ON) the corresponding alarm belongs to B-Alarm group.

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/kΩ” 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/kΩ” 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.)

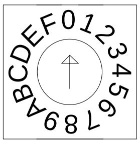
Calibration of temperature controlled charging voltage on the power board, SW8: 6.
If this switch is ON the alarm board gives a control signal to the power board that is equivalent to a battery temperature of +40 ºC. This function is utilised to check that the charger changes its output voltage correctly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

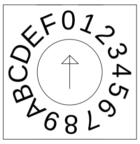
Calibration alarm board, SW8: 8.
Used mainly in production end test to calibrate the alarm board. If this switch is in ON position, the display is shifted one step to the left so that you can se 2 decimals on output voltage and current. If the leftmost position is a zero, this zero is suppressed which 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/kΩ” 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.)

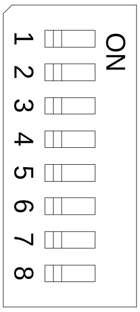
Short instruction for switches on alarm board



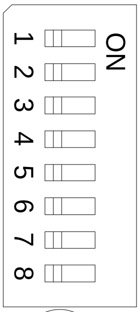
SW1
Delay A-alarm 10 sec/step. Step 0 gives 10 sec delay.



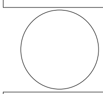
SW2
Delay A-alarm 30 sec/step. Step 0 gives 30 sec delay.



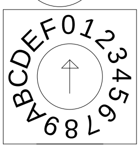
SW3
Blocking of individual alarms in the left column, from top to bottom. ON (right) position makes the alarms active, and OFF (left) position inhibits the corresponding alarm. If any individual alarm is blocked, this is indicated on the yellow LED in-between SW4 and SW5 and also on the yellow led on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



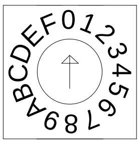
SW4
Decides if the individual alarms are of type A- or B-Alarm. Left (OFF) means that the alarm is of type A-Alarm and right (ON) position that it is of type B-Alarm. Switch 1 is Line failure, switch 2 is Rectifier failure and so on in the same order as on the front panel.
Normally:
Pos 1-6 OFF
Pos 7,8 ON
That is: Ground failure + and – are B-Alarm and the rest A-Alarms.



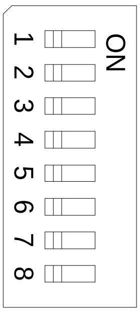
Yellow LED. On when any individual alarm is blocked.



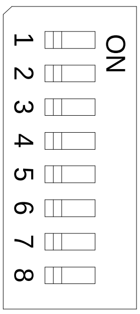
SW5
Selects charging voltage levels. (see 11604/11605/11606/11607/11608 depending on system voltage)



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

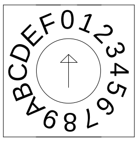
Adjustment of display reading.

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

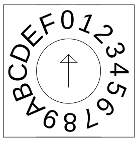
All measurements are done with 4½ digit resolution (>14 bits).
That accuracy is hard to get in the field, why this calibration is not recommended to do by the user. The adjustment is made on 5 trim potentiometers that are accessible through a hole under the display.
DO NOT ADJUST THESE POTENTIOMETERS!

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

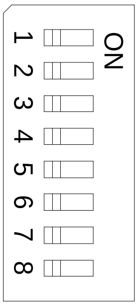
Factory settings.



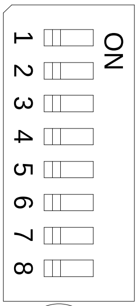
SW1
Delay A-alarm 10 sec = pos. 0



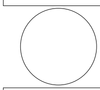
SW2
Delay B-alarm 30 sec = pos. 0.

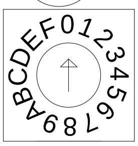


SW3
No individual alarm inhibited. (All ON)

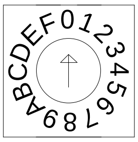


SW4
Decides if the individual alarms are of type A- or B-Alarm. Left (OFF) means that the alarm is of type A-Alarm and right (ON) position that it is of type B-Alarm. Switch 1 is Line failure, switch 2 is Rectifier failure and so on in the same order as on the front panel.
Pos 1-6 OFF
Pos 7,8 ON
That is: Ground failure + and – are B-Alarm and the rest A-Alarms.

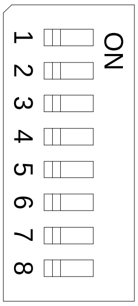




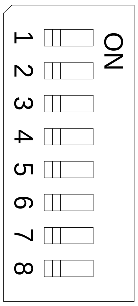
SW5
Float voltage. (see below)



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

Rectifier type: ……………………………………………

Serial no.: …………………………..

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

Tested and approved by: ……………………………………..

Date: ………………………………