

# FILM-TECH

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**RECTIFIER POWER SUPPLIES**

*N3 series*

**INSTALLATION AND OPERATION MANUAL**

**MAN0093/0**



**Warning !**

***You should read this manual before attempting any intervention inside the unit.***

***The noncompliance with the instructions given in this manual can lead to serious damage to the unit which in this case will invalidate the warranty.***

***No compensation or indemnity under any kind will be acknowledged for injury or damage due to use or misuse of the product, for poor operation of the appliances connected to IREM product or for immediate or indirect damage caused to the powered equipment.***

***During the warranty period the replacement of defective parts and maintenance procedures will be exclusively carried out at IREM servicing centre.***

***Keep this manual along with the unit.***

***CE declaration is available on request.***

This manual aims to give some operating instructions to the user in order to grant a safe and optimal use of the unit.

Keep this manual along with the unit. You should read it carefully both for installation, starting-up and maintenance procedures.

This manual is composed by the following sections:

- . description  
(product and application fields)
- . rectifier component layout
- . connection and operating information  
(directions for connection, start-up and use)
- . technical characteristics  
(technical specifications).

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## General purposes

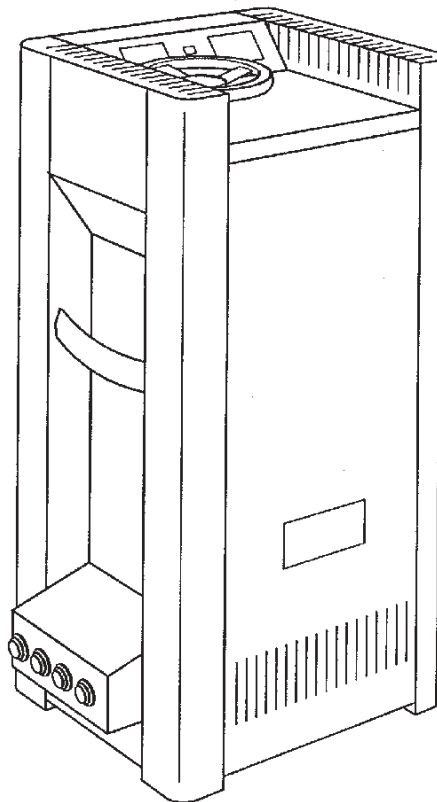
These high quality rectifier power supplies have been expressly designed to ensure the correct operation and long life of short arc Xenon lamps.

These units, developed to meet the recommendations of Xenon lamp manufacturers, are fitted with special **IREM** transformers with adjustable magnetic shunt for continuous output regulation over the entire operating range.

The new and peculiar design guarantees a low acoustical noise, i.e. less than 55dB(A). The special design, including an auxiliary filter unit, ensures a low ripple with a negligible starting energy. A 230V AC 2A auxiliary outlet provides power to the igniter when the unit is on.

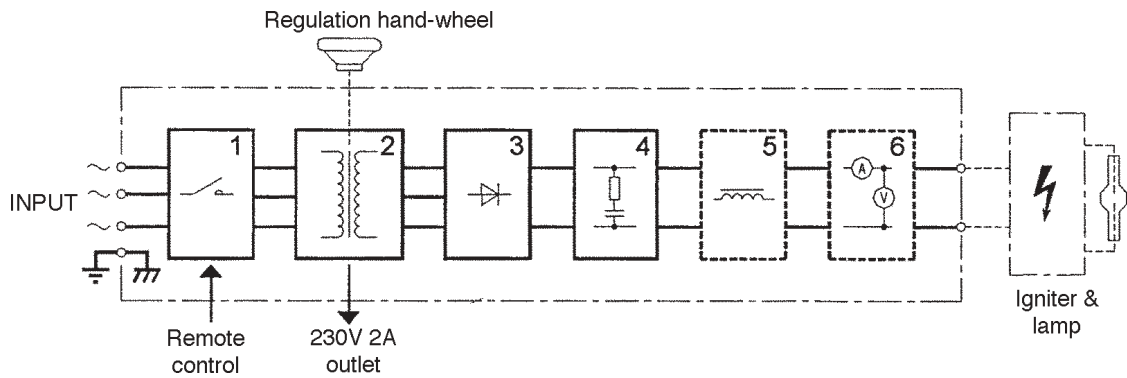
**N3** rectifiers are particularly suitable for:

- standard film projection
- special effects
- theatre applications
- architectural applications
- solar simulations.



## General purposes

### Block diagram



1. Main switch for remote control
2. Special transformer with magnetic shunt
3. Diode bridge rectifier
4. Filter and starting peak suppression circuit
5. Auxiliary filter (AFU) (only if present)
6. Voltmeter and ammeter (on request).

## General purposes

### Characteristics

The **N3** series rectifiers have been expressly designed to power Xenon lamps. The rectifier consists in a stray-flux transformer with adjustable magnetic shunt, a rectifying unit mounted on a heatsink and levelling filter.

The transformer is formed by three identical single phase transformers "T1, T2, T3" (5) whose primaries are star-connected.

The use of three single phase units "T1, T2, T3" (5) permits to get a balanced magnetic circuit such to reduce the ripple of the rectified output current.

The magnetic shunt "MS" (16), operated by the hand-wheel "H" (13), permits to adjust the output current according to the lamp manufacturers' specifications, even in case of  $\pm 10\%$  input voltage variations.

The transformer secondary windings, provided with central tap, power the diode assembly "D1, D2, D3, D4, D5, D6" (14), centre-tap connected, and protected by "C1, C2, C3, C4, C5, C6" capacitors (15).

An electrolytic capacitor "C7" (4) is connected in parallel across the output, working as a filter to reduce the residual ripple down to 8% peak-to-peak.

The "A1" ignition relay (3) limits the inrush current to the lamp, caused by the discharge of "C7" capacitor (4), and operates a resistor in series to "C7" at the ignition.

The power relay "K1" (6) may be remotely operated by a push button connected to the "X1" remote control terminal board (9).

On the "X1" terminal board, there are the "U V W" input terminals (8), "+ and -" output terminals (12), to be connected to the lamp, and the auxiliary terminals "B, H, A" (9), used to operate the power relay coil "K1" (6).

On request, these rectifiers can be supplied equipped with voltmeter (21) and ammeter (20).

On N3-150, N3-180 and N3-200 models, an additional filter unit (AFU) (19) has been added in order to reduce the output current ripple to a value lower than 3%. On demand, AFU filter unit may be assembled on N3-50, N3-80 and N3-100 models.

Rectifier power supply protection and lamp faulty operation warning:

These devices, mounted in conjunction with AFU filter, aim at:

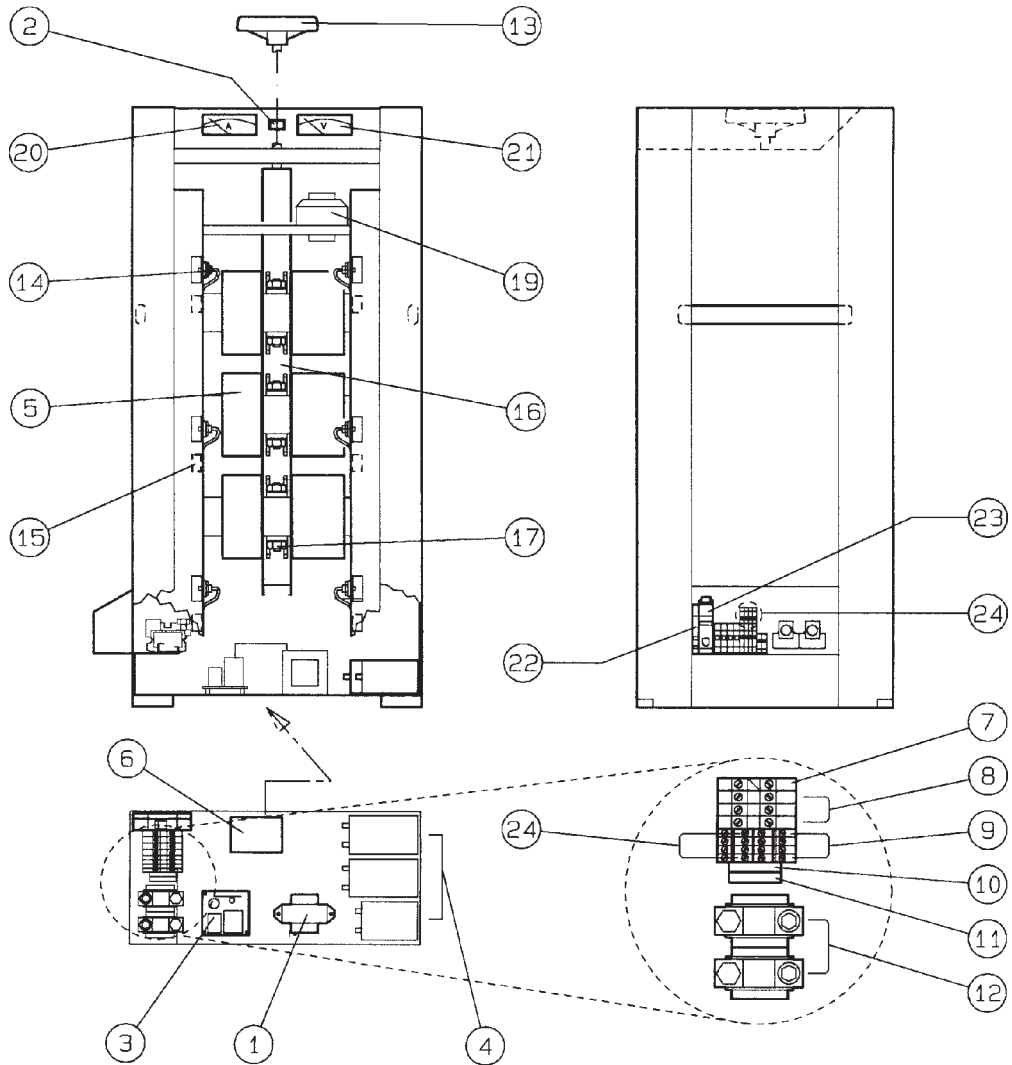
- . warning the user in case of anomalies that, even if not affecting the film projection, could damage the lamp or shorten its useful life (e.g.: a diode failure).
- . protecting the rectifier against wrong wiring connections during installation
- . protecting the rectifier against severe line disturbances (up to a possible lack of phase)
- . stopping a possible reignition of the rectifier if the failure has not been correctly detected or repaired.

The cabinet, equipped with carrying handles, permits an easy inspection of the inside components.

**Remark:** to reduce the risk of high frequency interference at lamp ignition, two capacitors have been added on the DC output.

**Component layout**

**N3-50 - N3-80 models**

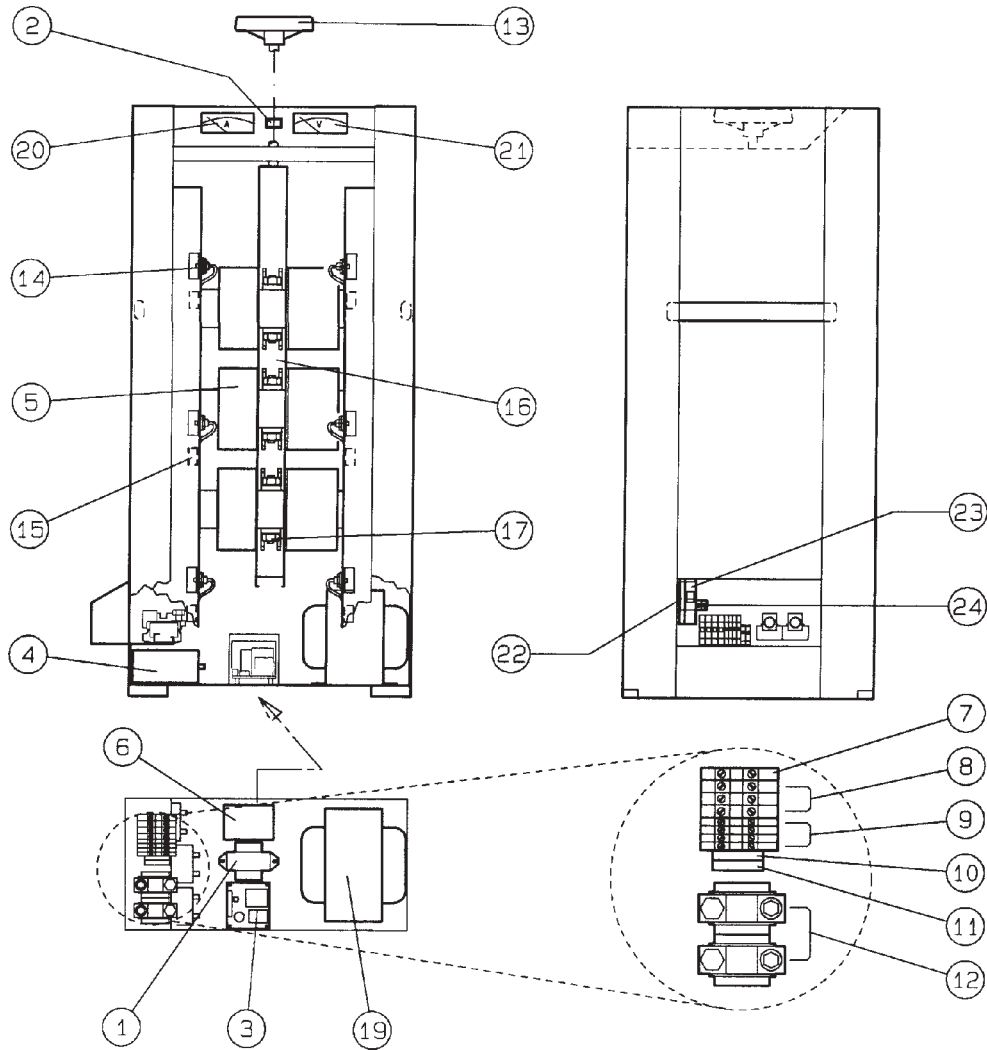


- |  |  |
|--|--|
| 1) Auxiliary autotransformer (T)<br>(for input voltage exceeding 240Vac) | 12) Output terminals (+, -)                |
| 2) ON/OFF switch (S2)  | 13) Adjustment hand-wheel                  |
| 3) Ignition relay (A1)   | 14) Silicon diodes (D1 to D6)              |
| 4) Output filter capacitors (C7-C8)                                      | 15) Protection capacitors (C1 to C6)       |
| 5) Transformers (T1 to T3)   | 16) Magnetic shunt (MS)                    |
| 6) Power relay (K1)  | 17) Magnetic shunt adjustment              |
| 7) Ground terminal (PE)  | 19) Auxiliary filter (AFU -L) (on request) |
| 8) Input terminals (U, V, W)   | 20) Ammeter (on request)                   |
| 9) Remote control and auxiliary<br>outlet terminal board                 | 21) Voltmeter (on request)                 |
| 10) Fuse (F1)  | 22) Auxiliary contact (S1)*                |
| 11) Fuse (F2)  | 23) Circuit breaker (QF)*                  |
|  | 24) Alarm ON/OFF terminals (X1)*           |
|  | * with AFU only                            |



**Component layout**

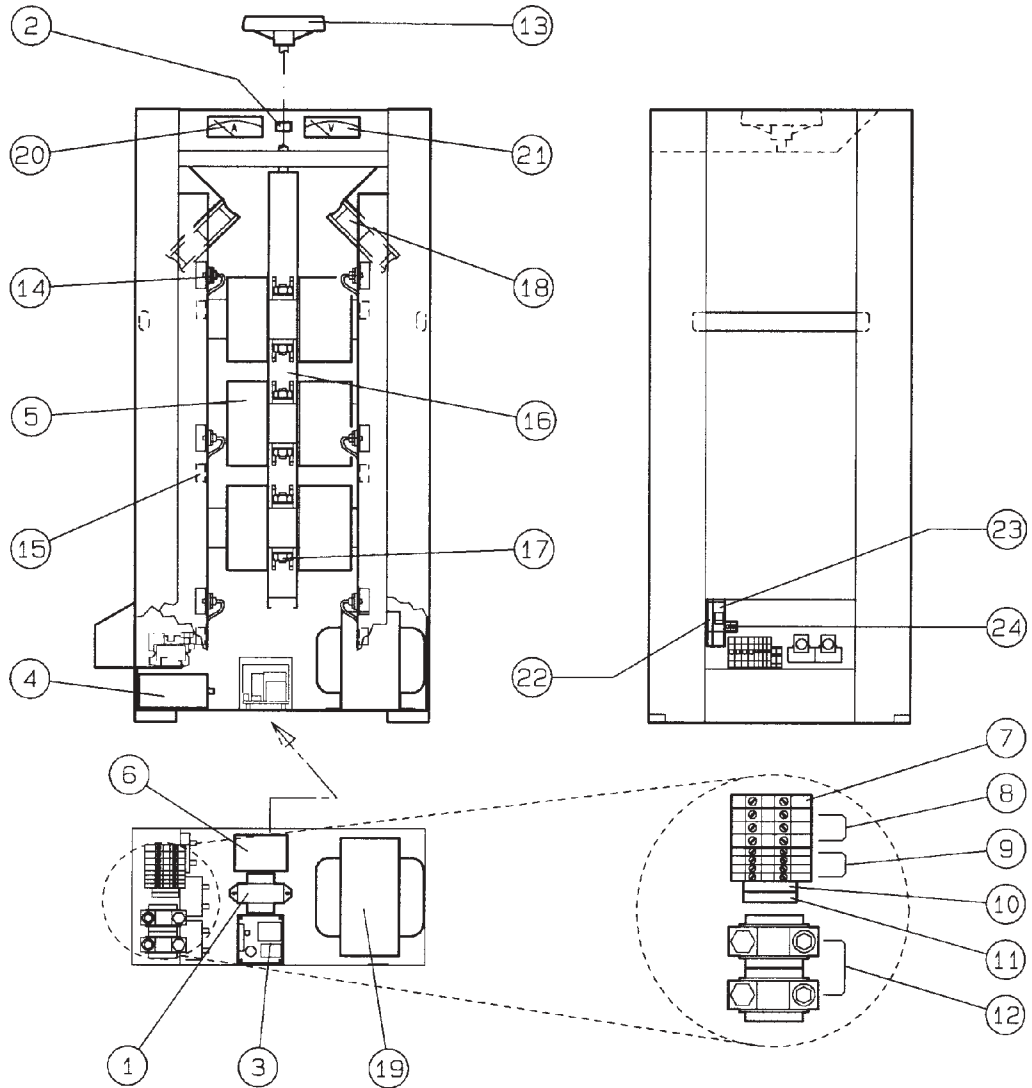
**N3-100 model**



- |  |  |
|--|--|
| 1) Auxiliary autotransformer (T)<br>(for input voltage exceeding 240Vac) | 12) Output terminals (+, -)                |
| 2) ON/OFF switch (S2)  | 13) Adjustment hand-wheel                  |
| 3) Ignition relay (A1)   | 14) Silicon diodes (D1 to D6)              |
| 4) Output filter capacitors (C7-C8)                                      | 15) Protection capacitors (C1 to C6)       |
| 5) Transformers (T1 to T3)   | 16) Magnetic shunt (MS)                    |
| 6) Power relay (K1)  | 17) Magnetic shunt adjustment              |
| 7) Ground terminal (PE)  | 19) Auxiliary filter (AFU -L) (on request) |
| 8) Input terminals (U, V, W)   | 20) Ammeter (on request)                   |
| 9) Remote control and auxiliary<br>outlet terminal board                 | 21) Voltmeter (on request)                 |
| 10) Fuse (F1)  | 22) Auxiliary contact (S1)*                |
| 11) Fuse (F2)  | 23) Circuit breaker (QF)*                  |
|  | 24) Alarm ON/OFF terminals (X2)*           |
|  | * with AFU only                            |

**Component layout**

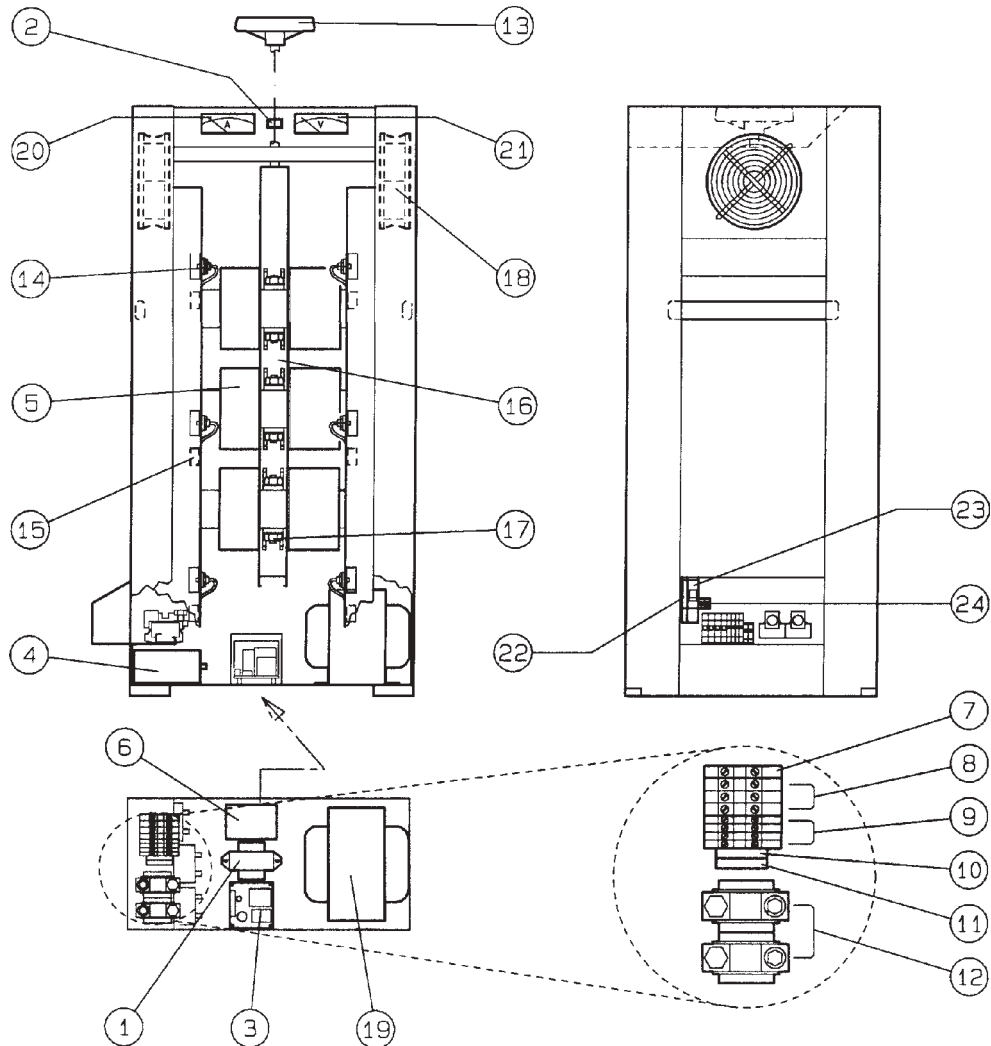
**N3-150 - N3-180 models**



- |  |                                      |
|--|--------------------------------------|
| 1) Auxiliary autotransformer (T)<br>(for input voltage exceeding 240Vac) | 12) Output terminals (+, -)          |
| 2) ON/OFF switch (S2)  | 13) Adjustment hand-wheel            |
| 3) Ignition relay (A1)   | 14) Silicon diodes (D1 to D6)        |
| 4) Output filter capacitors (C7-C8)                                      | 15) Protection capacitors (C1 to C6) |
| 5) Transformers (T1 to T3)   | 16) Magnetic shunt (MS)              |
| 6) Power relay (K1)  | 17) Magnetic shunt adjustment        |
| 7) Ground terminal (PE)  | 18) Axial fans (M1-M2)               |
| 8) Input terminals (U, V, W)   | 19) Auxiliary filter (AFU - L)       |
| 9) Remote control and auxiliary<br>outlet terminal board                 | 20) Ammeter (on request)             |
| 10) Fuse (F1)  | 21) Voltmeter (on request)           |
| 11) Fuse (F2)  | 22) Auxiliary contact (S1)           |
|  | 23) Circuit breaker (QF)             |
|  | 24) Alarm ON/OFF terminal (X2)       |

**Component layout**

**N3-200 model**



- |  |                                      |
|--|--------------------------------------|
| 1) Auxiliary autotransformer (T)<br>(for input voltage exceeding 240Vac) | 12) Output terminals (+, -)          |
| 2) ON/OFF switch (S2)  | 13) Adjustment hand-wheel            |
| 3) Ignition relay (A1)   | 14) Silicon diodes (D1 to D6)        |
| 4) Output filter capacitors (C7-C8)                                      | 15) Protection capacitors (C1 to C6) |
| 5) Transformers (T1 to T3)   | 16) Magnetic shunt (MS)              |
| 6) Power relay (K1)  | 17) Magnetic shunt adjustment        |
| 7) Ground terminal (PE)  | 18) Axial fans (M1-M2)               |
| 8) Input terminals (U, V, W)   | 19) Auxiliary filter (AFU - L)       |
| 9) Remote control and auxiliary<br>outlet terminal board                 | 20) Ammeter (on request)             |
| 10) Fuse (F1)  | 21) Voltmeter (on request)           |
| 11) Fuse (F2)  | 22) Auxiliary contact (S1)           |
|  | 23) Circuit breaker (QF)             |
|  | 24) Alarm ON/OFF terminal (X2)       |

## **Connection and operating information**

### **Receiving the equipment**

After receipt, check that the unit is in good condition. When necessary, contact the forwarding agent.

### **Delivery arrangement**

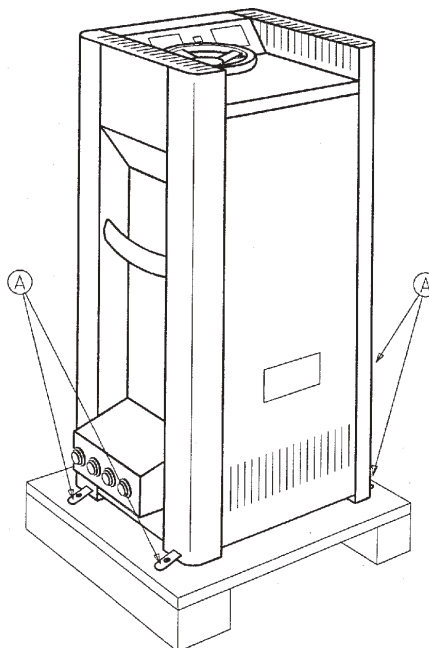
The supply consists of:  
**N3** rectifier power supply  
an installation and operation manual  
a warranty card.

### **Storage**

If the unit is stored before installation, check that it is kept dry and cannot come into contact with water in any form. Do not expose the unit to the sun rays or other sources of heat.

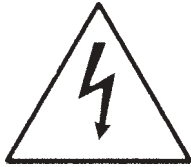
### **Package removing and handling**

Remove the packing and keep it in case of future transportation needs. Carefully lift the unit by means of its handles. Avoid any shock when moving. Four plaques with relevant anchoring bolts fix the unit during transportation. To remove the unit from the wooden base, unscrew the bolt screws.



## **Connection and operating information**

### **Warnings**



**Caution : dangerous voltage inside the rectifier power supply. Disconnect the unit from the mains before checking the internal components.**

**In case of failed ignition, wait 3 minutes at least for capacitor discharge.**

**Prevent water, liquids in general and/or foreign objects from getting inside the appliance (do not open the unit, contact IREM servicing centre !).**



**Check that a 100 mm (4 inch.) free space is left all around the unit to ensure the necessary ventilation and to prevent overheating.**

**To prevent blockages caused by overheating, do not expose the unit to the sun rays or other sources of heat.**

**Do not place anything on the upper side of the unit and ensure that the ventilation slots are unobstructed.**

**Installation must only be carried out by trained personnel.**

### **Preliminary checks**

**The connection must be carried out in compliance with the current safety standards. To ensure a correct operation of the unit, please strictly follow these recommendations:**

- the input powering has to be three phase and ground, withstanding current values as per unit dataplate
- the earth of the installation and the protections against indirect contacts must comply with current safety standards.

## Connection and operating information

### Installation - use

Connect the input and output lines to the "X1" terminal board, input terminals "U V W" (8), output terminals "+ and -" (12), by means of wires having a proper section (max. current density: 4A per sq/mm) and the ground wire to "PE" terminal (7).

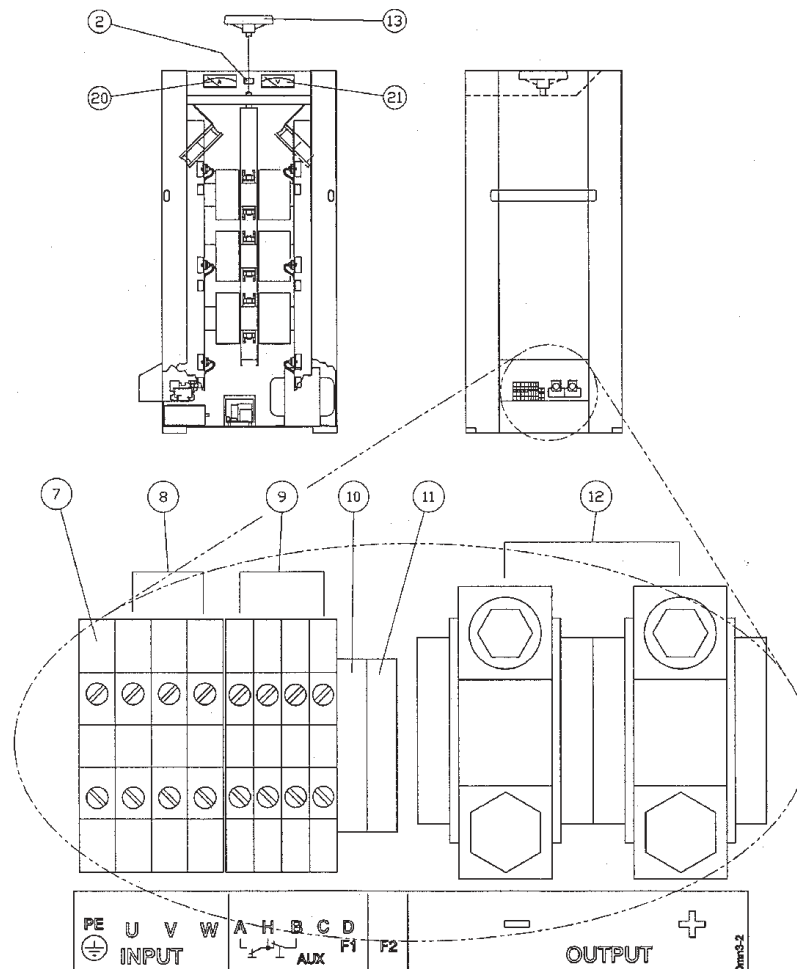
If the remote operation is required, connect the wires of the ON-OFF push button (see relevant wiring diagram) to the terminals marked "B, H, A" located on the terminal board (9).

On the same terminal board (9) and on the terminal (D) with fuse F1 (10), there is also a 230V 2A outlet to power the igniter.

After connecting the unit, switch on the rectifier by means of the ON-OFF switch (2) or the remote control, if installed.

When the lamp is on, adjust the current by means of the adjustment hand-wheel (13). On units equipped with meters, you can read the current value on the ammeter (20) and the voltage on the voltmeter (21).

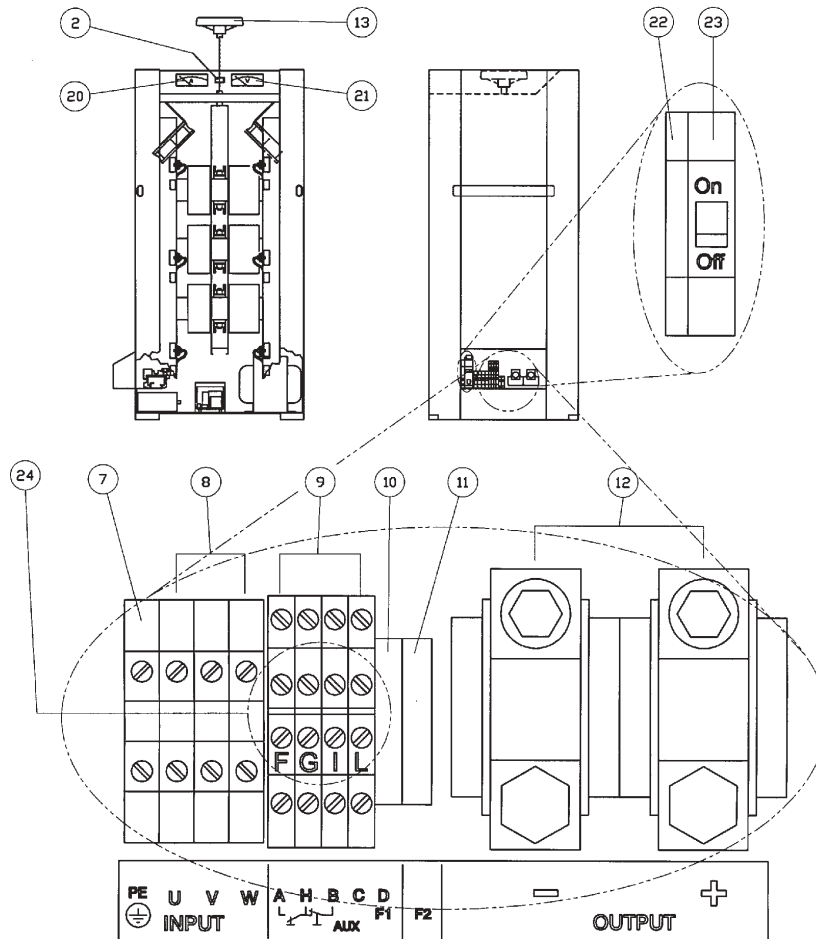
N3-50 and N3-80 without AFU



## Connection and operating information

### Installation - use

N3-50 and N3-80 equipped with AFU



Check that the circuit breaker (23) protecting the ignition relay board is set to ON.  
If the circuit breaker is set to OFF, move to ON.

The circuit breaker tripping is remotely signalled through two contacts (22) connected to the alarm ON terminals (X1 - 24).

When the unit is properly operated and the circuit breaker (23) is set to ON the status of the contacts is:

contact on terminals F-G: open  
contact on terminals I-L: closed

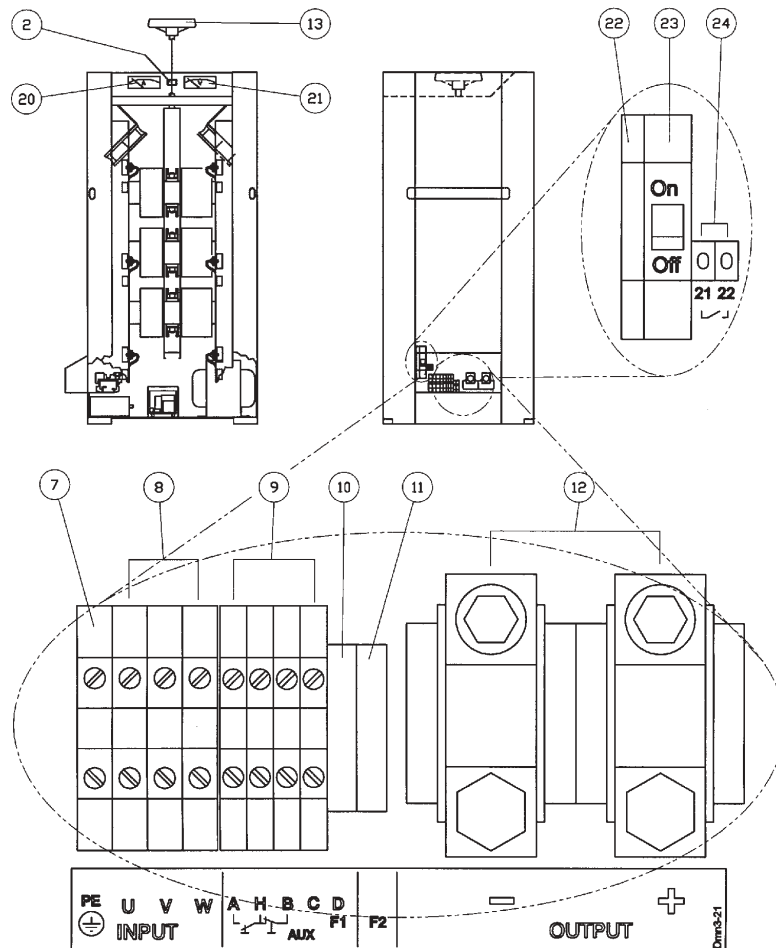
If the circuit breaker trips, the status of the contacts is:

contact on terminals F-G: closed  
contact on terminals I-L: open

## Connection and operating information

### Installation - use

N3-100\*, N3-150, N3-180, N3-200 equipped with AFU



Check that the circuit breaker (23) protecting the ignition relay board is set to ON. If the circuit breaker is set to OFF, move to ON.

The circuit breaker tripping is remotely signalled through one contact (22) connected to the alarm ON terminals (X2 - 24).

When the unit is properly operated and the circuit breaker (23) is set to ON the status of the contact is:  
contact on terminals 21-22: open

If the circuit breaker trips, the status of the contact is:  
contact on terminals 21-22: closed.

\* AFU on demand.



## **Connection and operating information**

### **Terminal board connection**

Take off the terminal cover by unscrewing the two fixing screws (see picture no. 1)



PICT. NO. 1

fixing screws

Take off the chocks (see pict. no. 2)



PICT. NO.2

## **Connection and operating information**

### **Terminal board connection**

Arrange the chocks and fix them to the leads before performing the connection (see pict. no. 3)



PICT. NO.3

Connect the cables to the terminal board and take in place the chocks (see pict. no. 4)



PICT. NO.4



PICT. NO.5

## Troubleshooting

### Possible failures



**Caution : dangerous voltage inside the rectifier power supply. Disconnect the unit from the mains before checking the internal components. Then wait 3 minutes at least for capacitor discharge.**

- A.** Operating the ON/OFF switch, the rectifier is not powered:
- 1) check the connection;
  - 2) check that the powering voltage is the proper one and that no phase is lacking;
  - 3) check the efficiency of K1 power relay; if damaged, replace it.
- B.** Operating the ON/OFF switch, the line protections blow:
- 1) check that there is no short circuit on the rectifier and, in particular, on the diodes "D1....D6", on the protection capacitors "C1....C6" of the rectifying heatsink and on "C7 or C8" capacitors.
- C.** The lamp does not ignite:
- 1) the lamp is damaged, replace it;
  - 2) there is no high voltage discharge into the lamp: check the proper operation of the igniter and verify that there is no discharge towards earth inside the lamphouse.
  - 3) if igniter and lamp are not damaged, check the efficiency of the rectifier: the no-load voltage must be 88V-130V approx.  
If the no-load voltage is low:
    - check that the powering voltage is the proper one and that no phase is lacking;
    - check the efficiency of the diodes; if some of them are damaged, replace them.
  - 4) be sure QF circuit breaker is set to ON (closed).
- D.** The output current has a too high ripple:
- 1) check that no phase is lacking;
  - 2) check the efficiency of the diodes; should they be damaged, replace them;
  - 3) check the efficiency of "C7 or C8" capacitors: if damaged, replace them;
  - 4) check the efficiency of "A1" ignition relay : if damaged, replace it.
  - 5) be sure QF circuit breaker is set to ON (closed).

## **Troubleshooting**

- E. QF circuit breaker (protecting A1 board) trips. S1 contact closes down to warn the user. Check:
- 1) the presence of all the three input phases (U, V, W). Check the powering line upstream the rectifier and reset the lacking phase. Set QF circuit breaker to ON.
  - 2) the efficiency of the diodes (the diodes could be short circuited or interrupted). When necessary, replace the faulty diode (see relevant instructions on this manual). Set QF circuit breaker to ON.
  - 3) the efficiency of C7 and C8 capacitors. The capacitors could be short circuited (low Ohmic resistance between the terminals). When necessary, replace the faulty capacitor. Set QF circuit breaker to ON.
  - 4) the continuity of K1 power relay contacts. If there is no continuity, replace K1.
  - 5) the absence of overheating on the wiring joints to: primary and secondary coils, diodes, heat sinks and AFU filter.
- When necessary, reset the fault wiring joints. Set QF circuit breaker to ON.

## **Preventive maintenance**

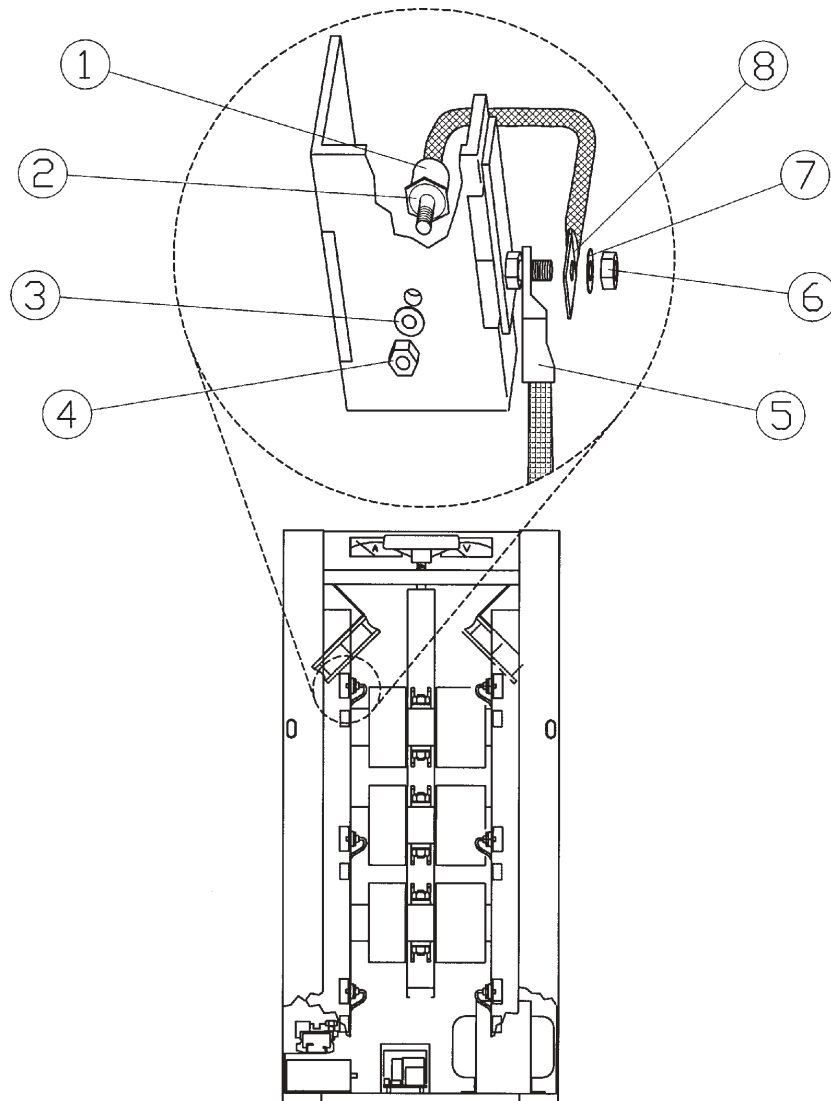
Some components must be periodically replaced. This is due to their particular constructive featuring (like ageing). So, schedule a preventive maintenance and/or replacement of components listed below:

- electrolytic capacitors (C7-C8): schedule a replacement every 5 years
- D1 to D6 diodes: replace every 10 years.  
**Important note:** diode lockage must be performed by means of a dynamometric wrench (torque wrench setting: 2.5N.m [22lb-in]).
- K1 power relay: replace every 10 years
- M1-M2 fans: dust and waste have to be removed once a year. Replace fans every 10 years.

## Troubleshooting

### Checking and replacing the diodes

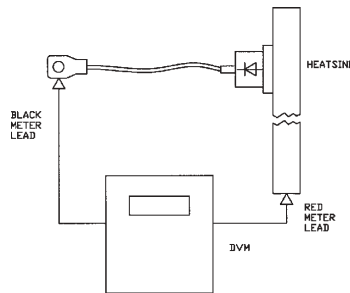
The 6 diodes (in groups of 3) are mounted onto the two heat sinks placed on the side. Replace the damaged diodes as per picture and instructions below.



- 1) Take off the M6 retaining nut (6) and the washer (7) by means of an hexagon wrench (10 mm/13/32"). Pull out the flexible end (tail) (8) from the screw terminal.
- 2) Set the multimeter (DVM) reading to the diode symbol.

## Troubleshooting

- 3) Connect the red probe to one of the two heat sinks. Remark: usually, the red probe is the positive pole of the DVM battery, whilst the black one is the negative. The test diagram is shown below.



If the diode is OK, the reading range should be within 0.4 and 0.6  $\Omega$ . Reversing the probes will result in an infinite reading (out of scale).

If the diode is interrupted, the measurement will result in an infinite reading (out of scale).

If the diode is shorted (most common case) the DVM reads a value close to 0  $\Omega$ , even reversing the probes.

If the probes of DVM battery have reverse poles, the measurement will result in infinite reading. The reverse polarity has no effect on interrupted or shorted diodes.

- 4) The damaged diode should be then replaced as follows:
1. lock the case (1) by means of an hexagonal wrench (17 mm type)
  2. by means of an hexagonal wrench (11 mm type ) completely rotate counter-clockwise the retaining nut (4) and the washer (3).

### Diode mounting directions

- a) spread some silicone compound onto the flat surface of the diode (2) (e.g.: Wacker silicone P12).
- b) insert the diode into the fixing hole . Lock the case (1) by means of a hexagonal wrench (17 mm type). Insert the spring washer (3) into the threaded tang and then rotate clockwise the retaining nut (4) by means of a dynamometric wrench (11 mm - 1/4") (wrenching torque: 3N·M (26.8 lbf.in).
- c) insert the diode end terminal (tail) (8) into the M6 retaining nut, and fix it by means of the washer (7) and the M6 nut (6).
- f) clamp the M6 nut (6) (dynamometric wrench: 10 mm - 13/32") (wrenching torque: 5N·M (45 lbf.in).

**Technical specifications**

Model	DC output		Three phase input voltage (V)	No-load voltage (V)	Max. drained power (kVA)	Drained current (A)	Current ripple (%)	Efficiency	Cooling
	V	A							
N3-50	16÷28	30÷55	208-230V - 60Hz	88	3	7.9	<8	>0.8	free convection
			220V - 50Hz	88		7.9			
			400V - 50Hz	92		4.3			
			415V - 50Hz	92		4.2			
N3-80	21÷35	43÷85	208-230V - 60Hz	116	5.8	15.2	<8	>0.8	free convection
			220V - 50Hz	116		15.2			
			400V - 50Hz	118		8.4			
			415V - 50Hz	118		8			
N3-100	23÷36	52÷110	208-230V - 60Hz	116	6.9	18	<8	>0.8	free convection
			220V - 50Hz	116		18			
			400V - 50Hz	120		10			
			415V - 50Hz	120		9.6			
N3-150	28÷40	80÷150	208-230V - 60Hz	116	9.4	24.7	<3	>0.8	forced ventilation
			220V - 50Hz	116		24.7			
			400V - 50Hz	120		13.6			
			415V - 50Hz	116		13			
N3-180	28÷48	110÷165	208-230V - 60Hz	128	13	34	<3	>0.8	forced ventilation
			220V - 50Hz	128		34			
			400V - 50Hz	128		18.8			
			415V - 50Hz	128		18.1			
N3-200	36÷55	110÷210	208-230V - 60Hz	168	18	48	<3	>0.8	forced ventilation
			220V - 50Hz	168		48			
			400V - 50Hz	168		26			
			415V - 50Hz	168		25			

Marking: CE, UL (for US market)  
 Operating temperature: 0°C to 40°C  
 Storage temperature: -20°C to +60°C  
 Degree of protection: IP20

**Power factor correction**

Rectifier model	Input voltage (V)	Reactive power (VAr)	Capacitor bank (μF)
N3-50	400 - 415	2000	3x15
	208-230 - 60Hz	1800	3x35
	230 - 50Hz		3x40
N3-80	400 - 415	3000	3x20
	208-230 - 60Hz	2800	3x50
	230 - 50Hz		3x60
N3-100	400 - 415	4500	3x30
	208-230 - 60Hz	4300	3x80
	230 - 50Hz		3x100
N3-150	400 - 415	7500	3x50
	208-230 - 60Hz	7300	3x130
	230 - 50Hz		3x60
N3-180	400 - 415	8750	3x60
	208-230 - 60Hz	8500	3x155
	230 - 50Hz		3x190
N3-200	400 - 415	12000	3x80
	208-230V 60Hz	11500	3x210
	230V 50Hz		3x250

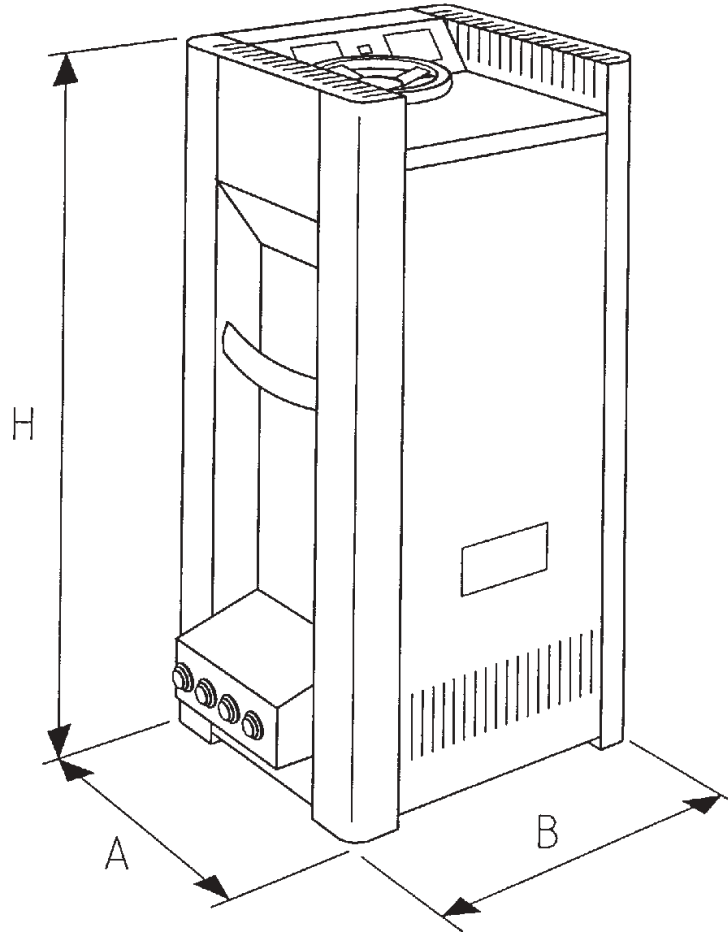
Capacitors are delta connected. They must be rated for the nominal voltage of the rectifier plus 10% at least.

Capacitors have to be connected to the input terminals (U V W).

For connection please refer to current safety standards.



**Outline drawing**



Model	Dimensions (mm) (A x B x H)	Weight (kg)
N3-50	410x350x840	84
N3-80	410x350x840	101
N3-100	460x410x940	127
N3-150	460x410x940	154
N3-180	460x410x940	175
N3-200	460x410x1040	207