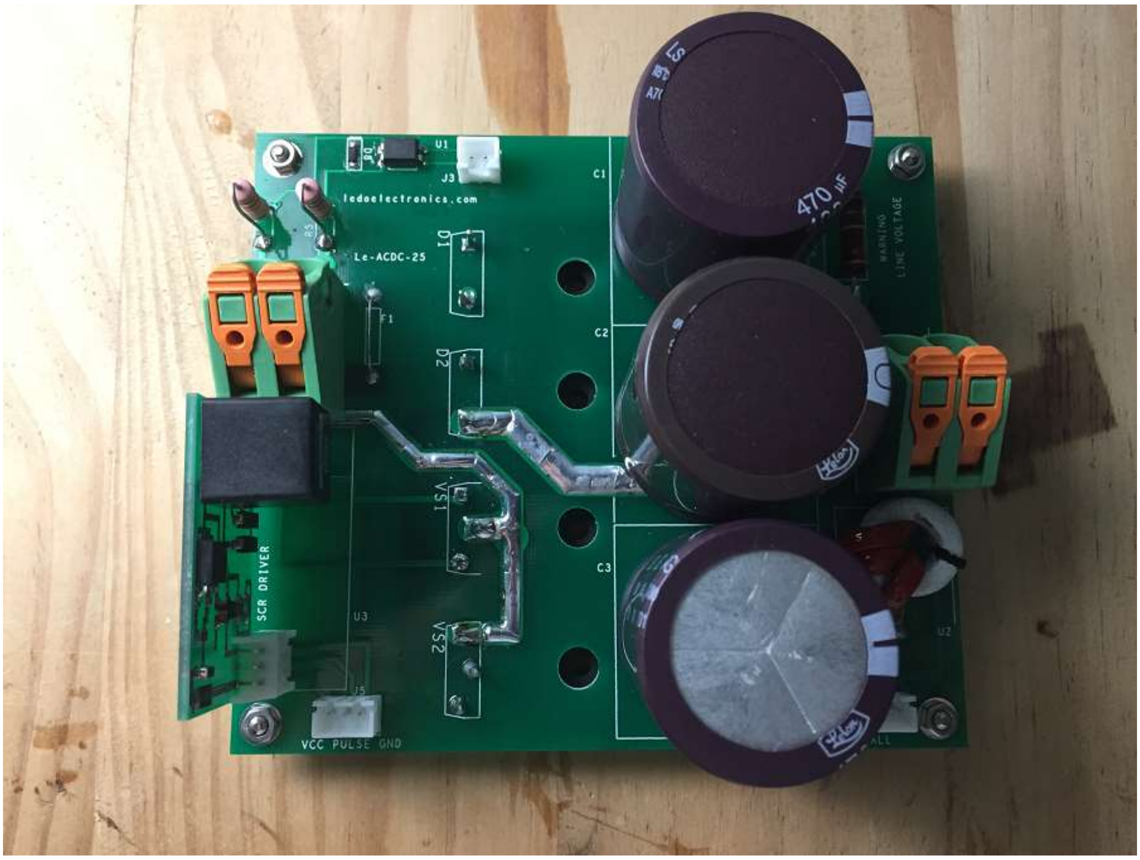
Le-ACDC-25 POWER RECTIFIER



- **Rectifier single phase semicontrolled, with capacitive filter**
- **Input voltage up to 270V AC**
- **Maximum output current 25A**
- **Soft start**
- **SCR Gate Driver integrated in the module**
- **Zero-cross signal isolated from the AC Line**
- **Hall linear current sensor.**

The module consists of a single phase rectifier bridge with capacitive filter, and has been designed to power a 5 KW welding inverter, but can be used in any other medium power application type.

The rectifier bridge is formed by diodes D1, D2 and the thyristors VS1, VS2. This allows to guarantee a soft start, by the progressive loading of the filter capacitors, without the need of additional components in the circuit.

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To achieve a soft start, the control circuit must make use of the zero-crossing signal from the network, present in connector J3, and decrease the firing angle of the thyristors from 180º to 0º in a linear fashion, in a few seconds during each power-up of the equipment.

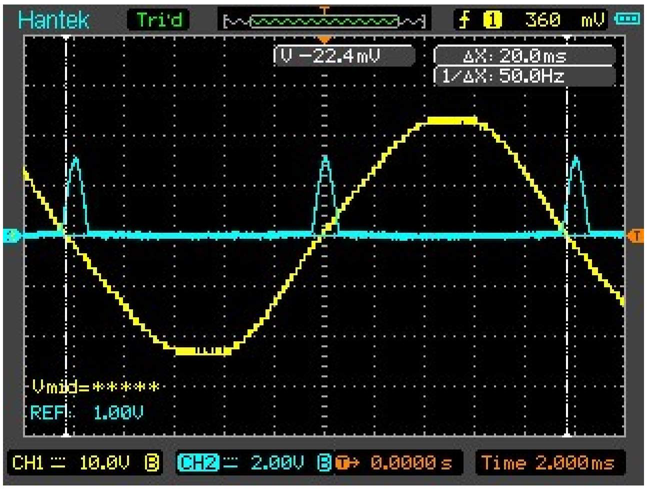

Fig.1. The blue curve represents the zero-crossing signal of the AC Line.

Fig. 1 shows an oscillogram of the network voltage and the synchronism signal. Keep in mind that the signal output in J3 is open collector, so you need a pullup resistance of a few kilos Ohms in the control circuit.

It is not recommended to use this method (regulation by phase) to regulate the output voltage of the rectifier, since the presence of the output capacitors makes this process critical. It only works with too large shooting angles, worsening the power factor and increasing the pulsations.

Recommended requirements for the Rectifier control circuit:

1. Have enabled a digital input, preferably with interruption capacity, to manage the zero-crossing signal of the AC network.

2. Have a digital output enabled, to generate the control pulses. Only one output is necessary for the control of the two SCRs. It is recommended to generate bursts of 2 ... 4 kHz, since as we can see in fig.2 the gate driver uses a pulse transformer.

3. Have an analog input to measure the current (this requirement is optional). The Hall detector output signal has a maximum variation between 0 ... 5V.

The control circuit, at each start, must generate short bursts of pulses synchronized with the network, with gradual reduction of the pulse delay for a few seconds; in this way a slow charge of the output filter capacitors is guaranteed. Once the charging process has been completed, the control circuit must maintain a constant frequency of several kHz in a constant manner, to ensure the safe conduction of the two thyristors. The rectifier stop is carried out in a simple way, inhibiting the control pulses. On the web www.ledoelectronics.com , a sample code of use is offered.

The semiconductors used, have a rated current of more than 30 A, but the maximum output current of the module is 25 A, limited by the width of the printed circuit tracks.

The Hall sensor present in the output of the rectifier, allows to measure accurately the consumption current, and can also be used as a means of protection of the circuit. The presence of thyristors allows the rectifier to be disconnected at any time. The sensor contains an Allegro UGN3503 chip placed in the air gap of the magnetic core of a coil through which the load current of the rectifier circulates.

The output voltage of the current sensor is 2.5V DC, in the absence of current, and increases linearly until reaching 4.5V for an output current of 30A.

The capacitor bank accumulates considerable energy, which takes about five minutes to dissipate, so care must be taken when handling the module during installation, service and repair.

POWER SUPPLY VOLTAGE	RECOMMENDED VALUE	CONNECTOR
GATE DRIVER	12…24 V DC	J5-1, J1-3
HALL SENSOR	5.0 V DC	J4-1, J4-2

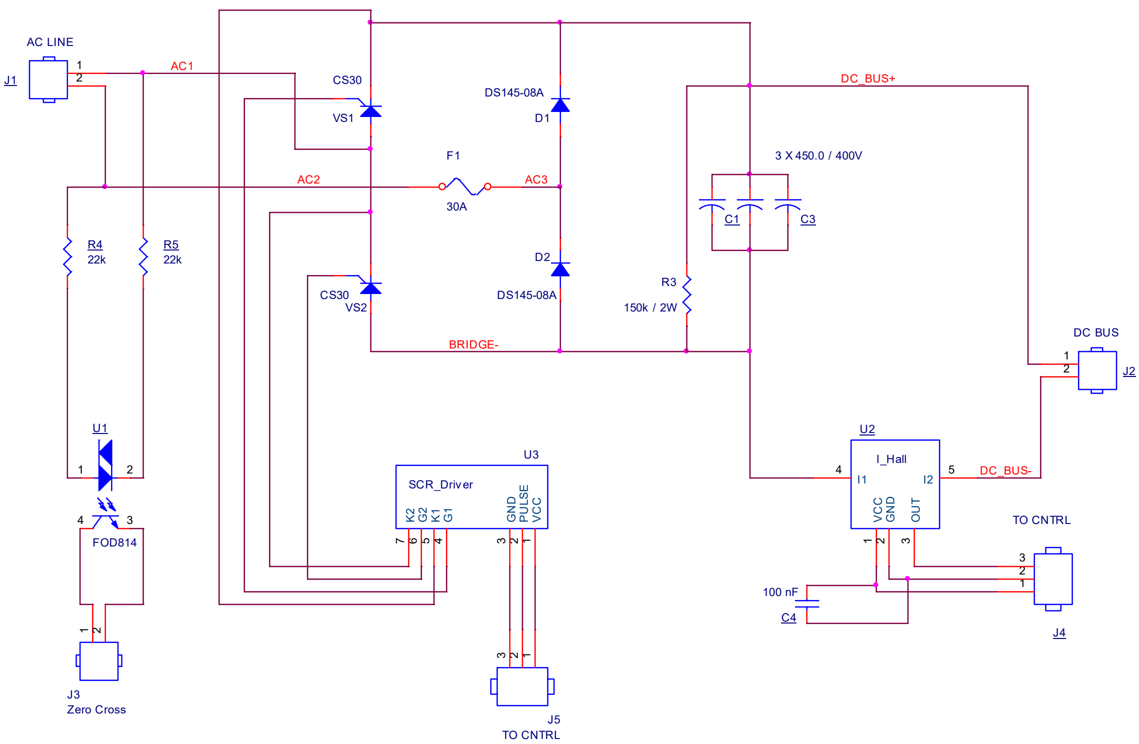

Fig.1. Electrical diagram of the rectifier.

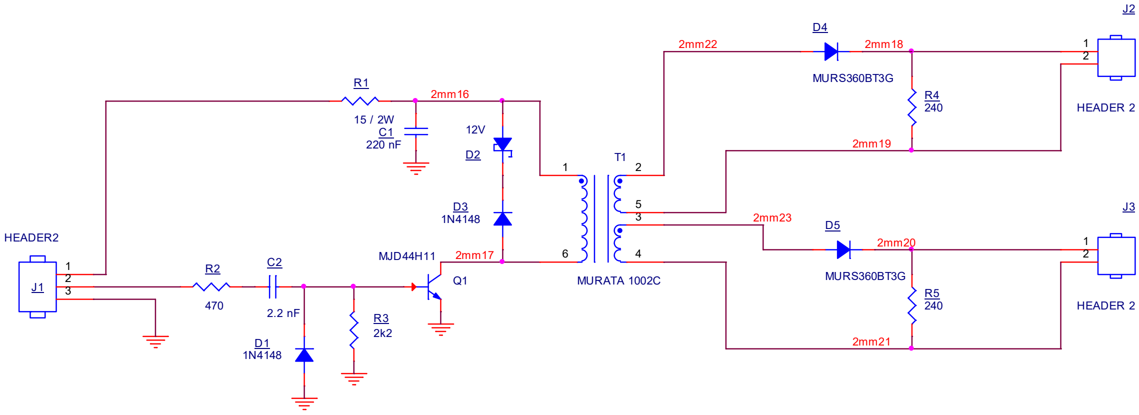

Fig.2. Gate driver integrated in the rectifier board.

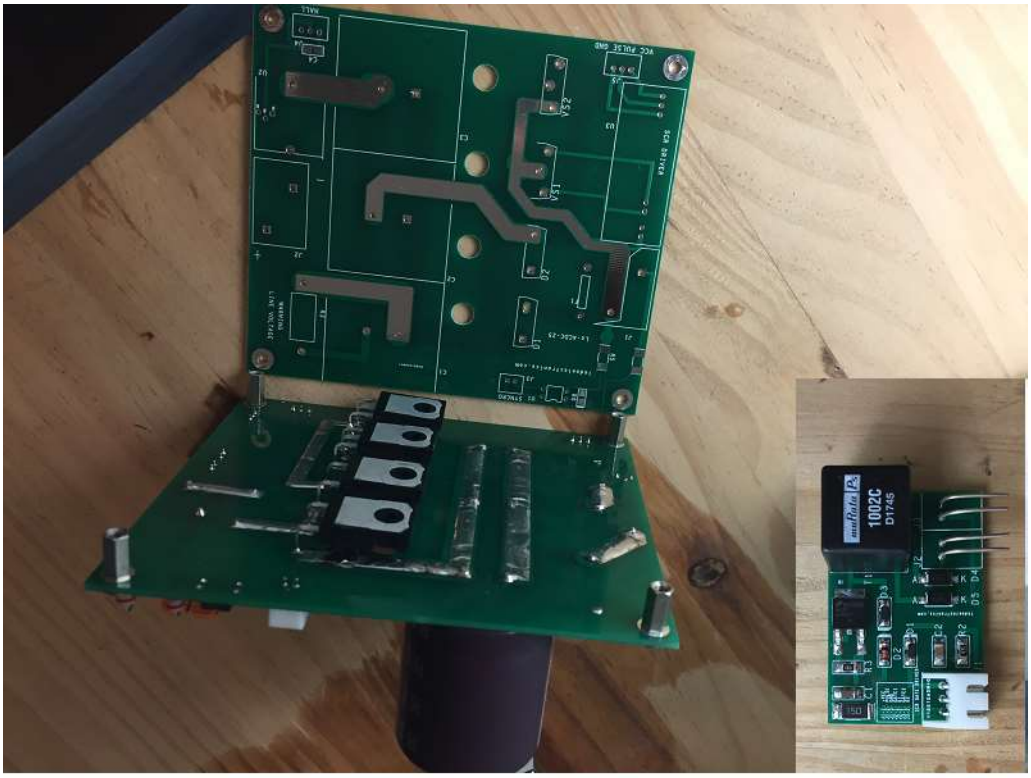

Fig.3. View from below, PCB and SCR Driver Board.

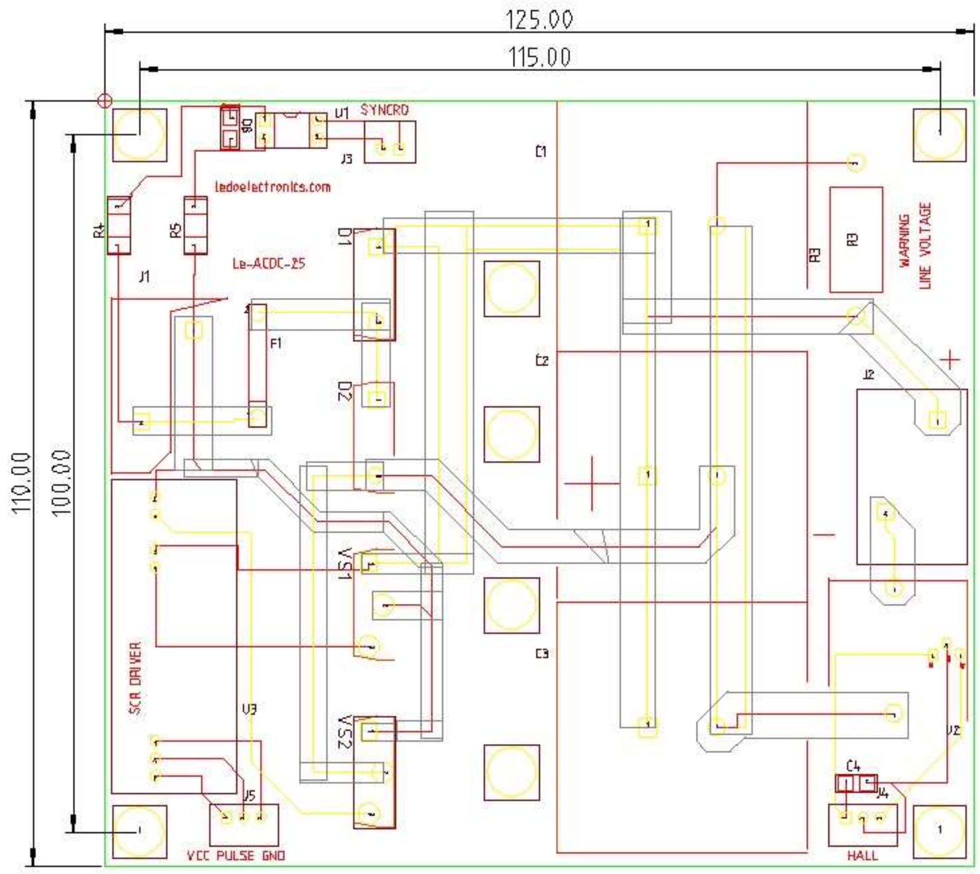

Fig.4. Board outline.

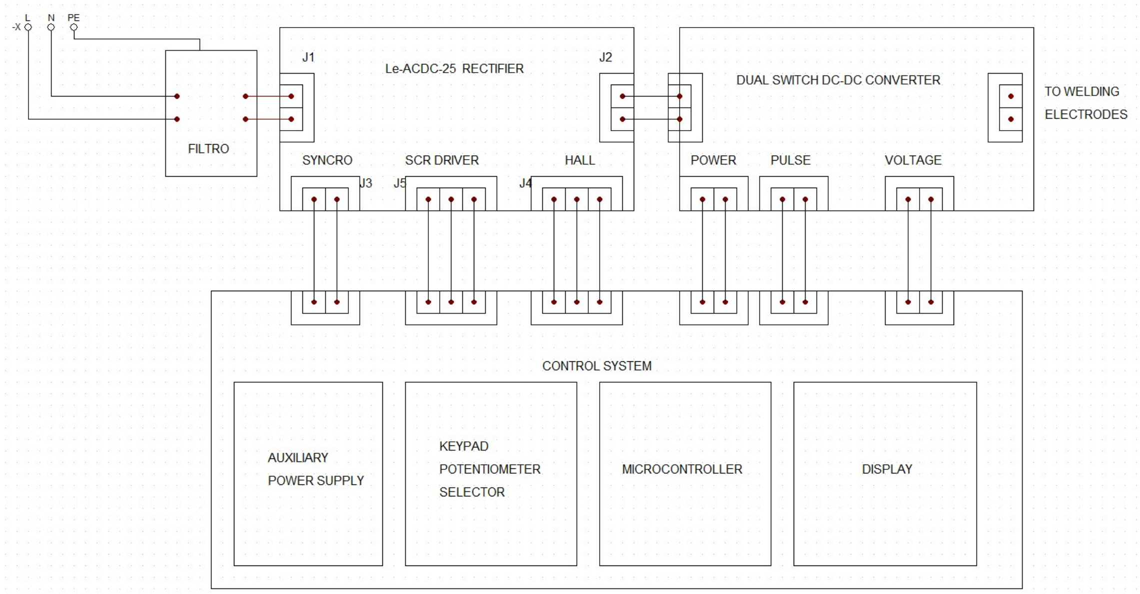

Fig.5. Example of use in a welding equipment.

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