OVERVIEW

Versatility is the main characteristics of this circuit, because it provides several options that allow its use to solve different applications.

This circuit can be adapted to rectification and control schemes like W1C, B2HZ, B2HK and B2HA. Also it can be applied to W1H and M1C.

The regulation can be done by voltage or by current through a potentiometer or by external signals. It also includes protection against current peaks, start up ramp, external bloking signal by relay, shunt on + or - terminal, direct input for current transformers, etc.

This circuit is suitable for applications where current control is required through SCRs, for example surface treatments, electrolytic processes, ovens, lightning, etc.

GENERAL DATA	
Mains supply	230/400 V_{RMS} 42 to 63 Hz
Load connection	SINGLE PHASE
Application circuits	W1C; M2C; B2HZ, B2HK, B2HA
Optional application circuits	W1H; M1C

REGULATION OPTIONS	
Voltage regulation	External potentiometer 4k7
	Analogic signal from 0 to 10 V_{DC}
Current regulation	External potentiometer 4k7
	Analogic signal from 0 to 10 V_{DC}
Firing angle (direct control)	Analogic signal from 0 to 10 V_{DC}
External block	External relay (open contact)

INTERNAL ADJUSTMENTS	
Voltage limit	R1 resistor (see documentation)
Maximum voltage	On-board potentiometer adjust ±10%
Maximum current	On-board potentiometer adjust ±10%
Start up ramp	On-board potentiometer adjust from 0,1 to 20”

SIGNALING	
External blocking	Red LED
Powered board	Green LED

FEEDBACK (INPUTS)	
Current feedback signal	Standard 60mV shunt positive leg
	Standard 60mV shunt negative leg
	Current transformer x/200 mA
Voltage feedback signal	DC voltage up to 300 V_{peak}

PROTECTIONS	
General	Fast acting fuse (1A)
Power ON	When powered (automatic “reset”)

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FIRING	
Minimum firing current (pulse train)	200 mA (1)
Maximum firing voltage (pulse train)	24 V
Maximum voltage pulse transformers	500 V_{RMS}

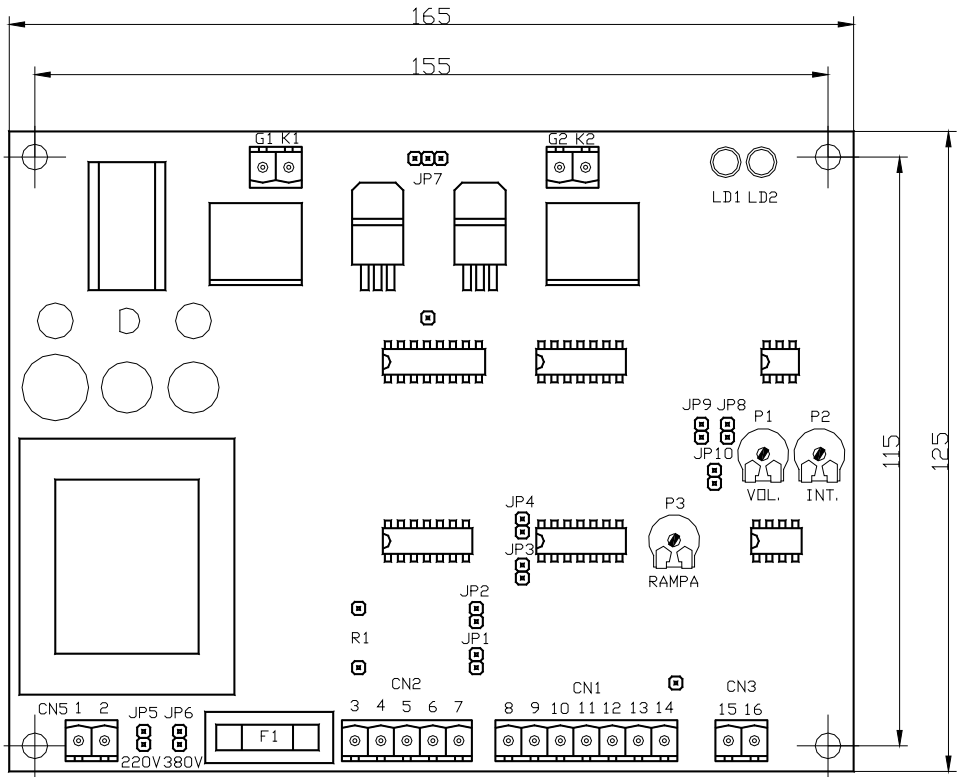
1-Measured with 20 Ohm load

CONNECTIONS	
Options select	On-board jumpers
Power supply, control and firing	Pluggable connectors (with screw)

ENVIRONMENTAL SPECIFICATIONS	
Protection degree	IP-00
Maximum humidity	50% Rh @ 35ºC / 70% RH @ 20ºC
Pollution degree	III
Electrical isolation	2500 V_{RMS} / 1min

DIMENSIONS	
Board	165x125x45 mm
Fixations	4x hole Ø4,2 mm

MECHANICAL DIMENSIONS



All dimensions in mm.

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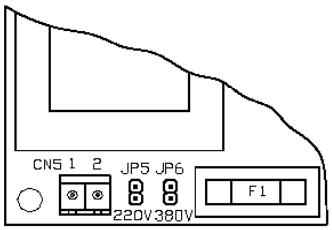
CONNECTIONS, SUPPLIER PART:

Protection fuse: one unit, type 5 x 20, 1 A fast type.



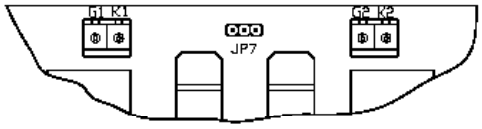
JP5 and **JP6** Jumpers
Selection of mains supply voltage:

-Mains voltage **230 V**: connect **JP6**
-Mains voltage **400 V**: connect **JP5**

CN5

Terminals 1 and 2, are connections to input grid. Firing system differences each network halfwave, so synchronism should be mantained with the thyristors (if the operation is incorrect, there isn't output signal, just reverse power supply wires).

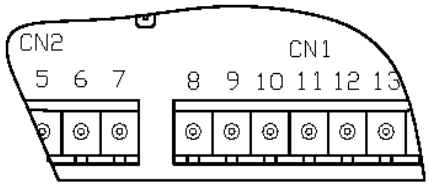
CONNECTIONS, FIRING PART:



CONNECTOR	GATE	CATHODE
CN4	G1	K1
CN6	G2	K2

Note: for SCR connection see "TYPICAL APPLICATION CIRCUITS", where appear several combinations of SCRs and diodes.

CONNECTIONS, CONTROL PART:



CN2

Terminal 6: Positive pin, blocking signal. This pin has a 24 V output for sensor supply.

Terminal 7: Negative pin blocking signal.

CN1

Terminal 8: Positive pin, voltage regulator potentiometer.

Terminal 9: Regulation pin, voltage regulator potentiometer.

Terminal 10: Ground pin, voltage regulator potentiometer.

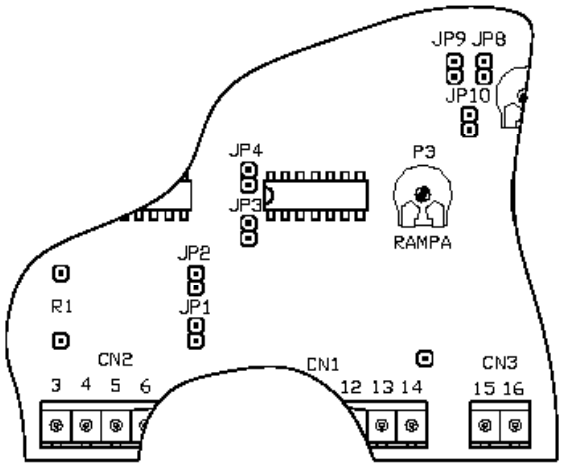
Terminal 11: Positive pin, current regulator potentiometer.

Terminal 12: Regulation pin, current regulator potentiometer.

Terminal 13:Ground pin, current regulator potentiometer. Conection to negative signal of external control (0 to 10 V).

Notes:
- Potentiometers can be of any type, with 4k7Ω value.
- When the potentiometer points to the positive side, maximum voltage is being supplied.
- It is possible to control these inputs with voltages from 0 V to 10 V (connecting to regulation and ground pins).
- For the operation without signal bloking, contact must be normally on (a jumper can be connected between both pins), signal bloking is done opening the circuit through a switch, thermostat, fuse microswitch, etc.

CONNECTIONS, FEEDBACK PART:



CN2

CN2 lead connects feedback signals. In cases where firing board is controlled by an external device, like PLC, microcontroller, etc., without isolated outputs, it must be sure that feedback circuits are isolated. **Devices like "shunt" for the feedback current won't work and also do not use a direct voltage feedback.** For this cases there are available modules specially designed to work with this firing board.

Terminal 3: Voltage feedback input.

Terminal 4: Current feedback input with 60 mV shunt. In cases where it's necessary a feedback with galvanic isolation, an isolated sensor (Hall effect) can be used, knowing that a voltage adaptation to 0-60 mV will be required.

Terminal 5: Voltage and current feedback common pin (ground).

CN1

Terminal 13: External control signal, negative pin from 0 to 10 V (ground).

Terminal 14: External control signal, positive pin from 0 to 10 V.

CN3

Terminal 15: Auxiliary feedback input.

Terminal 16: Auxiliary feedback input.

Note: Auxiliary feedback uses a signal from the current transformer (output 200mA) in order to be able to regulate the intensity of the alternating current. Below the recommended types for this application:

TTS017 25-50-100A/0.2A	Current input: available 25, 50 or 100 A.
TTS040 200-300-400/0.2A	Current input: available 200, 300 o 400 A.
TTS040 600/0.2A	Current input: 600 A.

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R1 Resistor: Reference resistor of the maximum voltage regulation, it must be calculated following below indications:

- Feedback for control bridge rectifier.

For a direct feedback (without galvanic isolation): R1 = 1500/Vr.
R1: [kΩ], Vr:[V] (maximum output voltage of the rectifier bridge)

- Feedback for AC-AC control.

Feedback with SCCAV01 (without galvanic isolation): R1 = 1650/Vr
R1: [kΩ], Vr:[V] (maximum output voltage of the AC-AC converter)

Feedback with SCCAV02-OA (galvanic isolation): R1 = 82 kΩ

JP1: Shunt selection in terminal -.

JP2: Shunt selection in terminal +.

JP3: Feedback selection by shunt.

JP4: Auxiliary feedback selection.

JP9: Internal feedback selection (current and voltage control).

JP8: Internal feedback selection (current and voltage control).

JP10: External feedback selection (direct control of conduction angle) with control signal of 0 to 10 V.

PROGRAMMING TABLE.

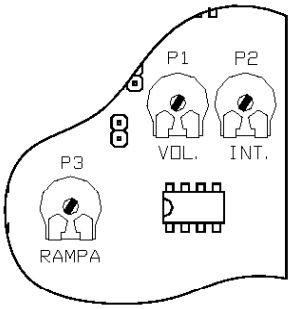
APPLICATION CIRCUIT	JP1	JP2	JP3	JP4	JP8	JP9	JP10
Shunt + rectifier		■	■		■	■	
Shunt - rectifier	■		■		■	■	
Aux. feedback AC regulation	■			■	■	■	
External control 0-10 V							■
Ext. feedback (SCCAV02 OA)	■		■		■	■	

MAINS POWER SUPPLY	JP5	JP6
230 V mains voltage		■

Jumper connected	■

Notes:
- Double check the jumpers position, as described above, a bad positioning will produce a bad function.
- JP7 jumper it is reserved for special applications of external amplification (SCRs in parallel), do not use it for any other function.
- For the AC control case, the calculation of the R1 resistor it is different respect the others, due to in this case it has been considered the variations of the AC to DC conversion for the feedback (RGCAV01 module, described in “TYPICAL APPLICATION CIRCUITS”)..

AVAILABLE TUNINGS.



P1: Maximum voltage adjustment potentiometer (it limits the voltage in the maximum position).

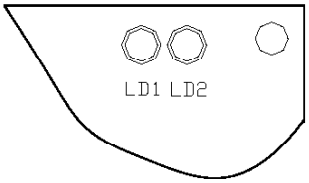
P2: Maximum current adjustment potentiometer (it limits the current in the maximum position).

P3: Ramp adjustment potentiometer.

SIGNALING:

LD1: Green LED, power supply signal.

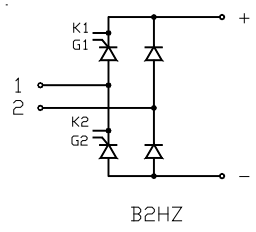
LD2: Red LED, SCR firing bloking state.



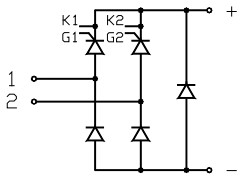
TYPICAL APPLICATION CIRCUITS:

Bellow, there are the most usual applications circuits (different combinations of rectifiers and antiparallel thyristors), as well as feedback connections for shunt, transformer, etc.
The following descriptions are made separately for the firing part and feedback, because both can be combined in different ways (for example, an antiparallel control (AC) taking the feedback from a rectifier (DC), a typical application would be the transformer control for primary of a surface treatment).

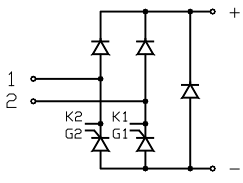
Finally of this description are some indications which are good to improve the working security and to prevent circuits from possible external problems.



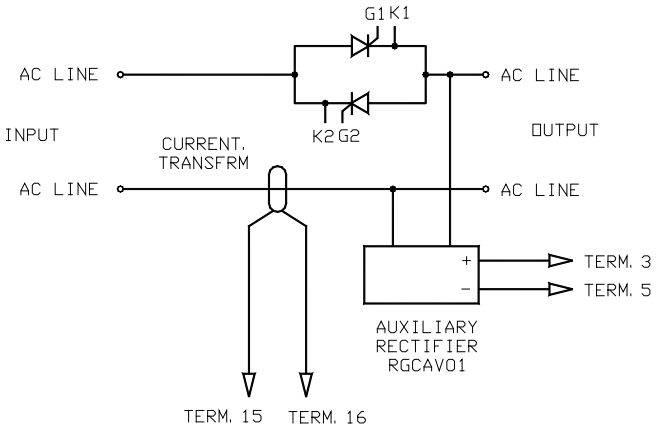
B2HZ



B2HKF



B2HAF



This application is used only for AC output.
(for DC output it is more convenient to use a shunt).

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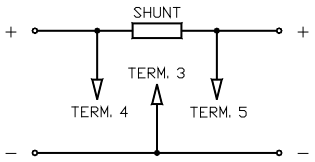
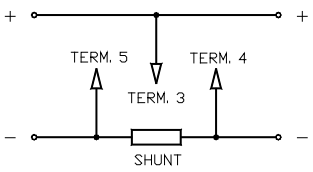
FEEDBACK CIRCUITS (DIRECT CURRENT):



+ SHUNT APPLICATION



– SHUNT APPLICATION

Indicated terminals corresponds to CN2 connector of regulation board (please see “CONNECTIONS, FDBCK PART”).

MOUNTING RECOMMENDATIONS:

1.- Avoid excessively long cables for the firing system, or use twisted or shielded cables. You can apply the same to the potentiometer cables.

2.- Separate the firing board from magnetic fields, like power transformers. If this is not possible, put the firing board to a conductive surface with ground connection.

3.- For inductive or capacitive loads with frequently connection cycles, it’s advisable to use a fixed resistive load (low value), in order to avoid regulation fails during the start up. This is valid for all type of stacks.

4.- When it will be possible it is advisable to make tests with small loads (e.g. bulbs or resistors), in this way, any possible error for the connections will be detected with no serious consequences for the device to be controlled. The sensibility of the feedbacks should be take in care because it can be insufficient with loads which don’t use to much current, so the control operation could be wrong.

5.- In AC control applications with voltage regulation, it must be added an auxiliary rectifier module SCCAV01 (galvanic isolation it’s lost with the network). If this is an inconvenient, it must be used a isolated version, SCCAV02 OA.

6.- Devices for current feedback like “shunts” doesn’t provide galvanic isolation in the power stage. In cases where isolation is required, its recommended to use isolated current sensors (e.g. Hall effect sensors).

7.- In applications with variable loads, parasitic components in the grid, regulation with minimum voltages and currents, etc., can be produced non desired regulation oscillations. In these cases, contact to our technical department to indicate you the best solution.

8.- For specific applications, it’s possible to do arrangements or connect auxiliary control modules.

Notes about card application in systems controlled by microcontrollers:

When SC2000 is controlled by an external system, microcontroller, PLC, etc., it is essential to guaranty galvanic isolation between control signals and power circuits. A lack of isolation produces current circulation between the power stage and control circuits causing damages to the control devices.

In case of doubt, contact to our technical department which have large experience to propose suitable solutions for each case.

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