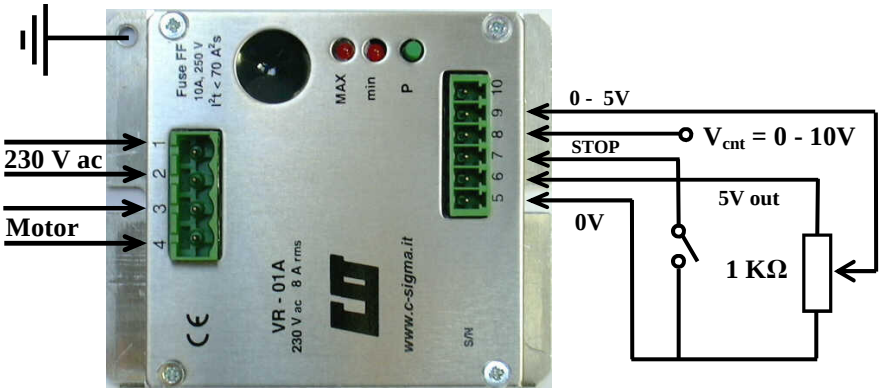
C-SIGMA

Single Phase Voltage Regulator VR-01A



SMD Technology.

Micro Controller Unit based Control Algorithm.

Rugged construction, fully encapsulated in protective epoxy.

Short-circuit proof internal auxiliary transformer (to supply the control circuitry).

For higher reliability, only self-healing film capacitors are used (no electrolytics).

A version with on board fuse-holder is also available.

DESCRIPTION

The principle of operation is based on the control of the conduction angle by means of a 700V, 12A, triac. This choice allows ample margins of operation with respect to the nominal 8 A rms, 230V ac, values specified for our VR-01A single phase voltage regulator. Said ample margins result in good immunity towards transient over-currents and over-voltages, thus improving overall reliability. As a further protection against higher energy over-voltages, the VR-01A regulator already includes a suitable varistor. The triac's conduction angle is controlled by a microcontroller unit (MCU), whose control algorithm converts the value of the control voltage (0-10V, or 0-5V from a potentiometer) into a "pulse train", which is then applied to the triac's gate until the next zero crossing of the mains voltage. The "pulse train" technique is known to provide stable control even with loads characterized by a dominant inductive component. Thus, the VR-01A regulator is ideally suited for the control of single phase high slip motors, typical in applications such as fans and roll winder machines. Furthermore, the algorithm implemented in the MCU allows to simplify the calibration of the control characteristics (fig. 2): it is sufficient to input the ***min*** and ***MAX*** points only once, and the MCU will then automatically compute both slope and offset of the control characteristics.

CHARACTERISTICS

Mains voltage:	230 V ac @ 50/60 Hz	Maximum load current:	8 A_{rms}
Non repetitive peak current (20ms):	120 A	I^2t for fusing (10ms):	78 A^2s (*)
Power dissipation:	10W @ 8A_{rms} 6W @ 4A_{rms}	Case - Ambient R_{th}:	3.5℃/W (**)
Case temperature :	-25℃ a 70℃	External Potentiometer:	1 K Ω
Mains – Case isolation:	2500 V_{rms}	Mains - Control section isolation:	3750 V_{rms}
W x L x H:	72 x 86 x 30 mm	Weight:	250 gr

(*) Thus, for adequate protection install only ultra rapid fuses (specific for semiconductors) with lower I^2t value.
(**) For optimal performance apply a thin layer of thermal paste over the bottom surface.

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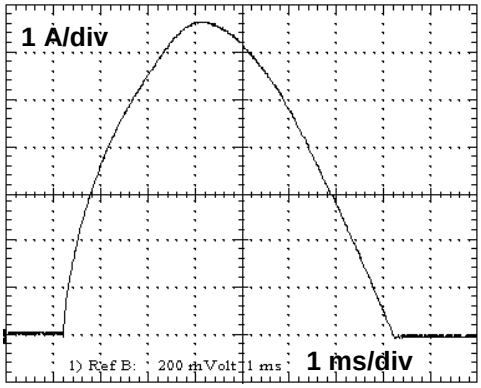
COMPLIANCE TO STANDARDS

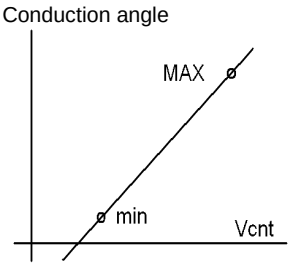
VR-01A is suited for applications in industrial machinery compliant with the requirements of the Low Voltage Directive (72/23/CEE) and Machinery Directive (89/392/CEE), as well as to the requirements of the Italian Norma Generale CEI EN 60204-1 1998-04. Referring to Electromagnetic Compatibility, the verification of the level of overall emissions from the end application machinery is the sole responsibility of the manufacturer of said machinery. However, when properly connected, conducted emissions from the VR-01A itself are usually very small (see the example of fig. 1), and in most cases the conventional filters usually installed in industrial control cabinets would suffice to ensure compliance with applicable regulations.



1 - Load current example (4 A_{rms}) while driving a high slip motor in a winder machine application.

INSTALLATION

The installation of this equipment shall be performed by qualified personnel only.
It is the users' responsibility to make sure that the installation of the VR-01A into their machinery complies with the laws and regulations applicable in their countries.



2 - Control Characteristics.

The VR-01A control characteristics (conduction angle versus control voltage) is linear. When the control voltage is applied to pin 8 (input impedance = 20 KΩ) the allowed range is 0-10V, when applied to pin 9 (input impedance > 500 KΩ) the allowed range is 0-5V. Pin 9 can also be driven by the center tap of a potentiometer (1 KΩ) between the auxiliary 5V output (pin 6) and the 0V reference (pin 5). The MCU automatically computes slope and offset of the control characteristics starting from two calibration measurements, ***min*** and ***MAX***, that the user defines by means of the following procedure:

- Connect the VR-01A to the load you wish to control (example: a high slip motor), adding a ***true rms*** ammeter to measure the load current.
- Power On while pressing on the push button, and the ***min LED*** will start flashing.
- Release the button and then set the control voltage (or the potmeter position) to the value desired for the "***min***" point (example: V_{cnt} = 1V). Press again the button, until the ***min LED*** stops flashing and is constantly ON, so as to input said control voltage ***min*** value, and then release it.
- Now that the ***min LED*** is always ON progressively change the control voltage (or rotate the potmeter knob) until the ammeter reads the ***true rms load current value*** desired for the "***min***" point (example: I_{load} = 0.5 A_{rms}).
- Press again the button to input said desired "***min***" point rms current value.
- Upon releasing the button the ***min LED*** will now turn off, and the ***MAX LED*** will instead start flashing.
- Set the control voltage (or the potmeter position) to the value desired for the "***MAX***" point (ex. : V_{cnt} = 10V). Press again the button, until the ***MAX LED*** stops flashing and is constantly ON, so as to input said control voltage ***MAX*** value, and then release it.
- Now that the ***MAX LED*** is always ON progressively change the control voltage (or rotate the potmeter knob) until the ammeter reads the ***true rms load current value*** desired for the "***MAX***" point (example: I_{load} = 8 A_{rms}).
- Press again the button to input said desired "***MAX***" point rms current value.

In case of mistakes, before repeating the above ***min*** and ***MAX*** points calibration procedure, the following reset is at first needed: with no load connected (thus, now no need to measure current), proceed as above for the "***min***" point, but while constantly holding V_{cnt} = 0V (or potmeter at min), and then for the "***MAX***" point, but while constantly holding V_{cnt} = 10V (or potmeter at max).

LEDs CODE

min LED flashing = VR-01A powered ON

MAX LED flashing = VR-01A switched to STOP

CE

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