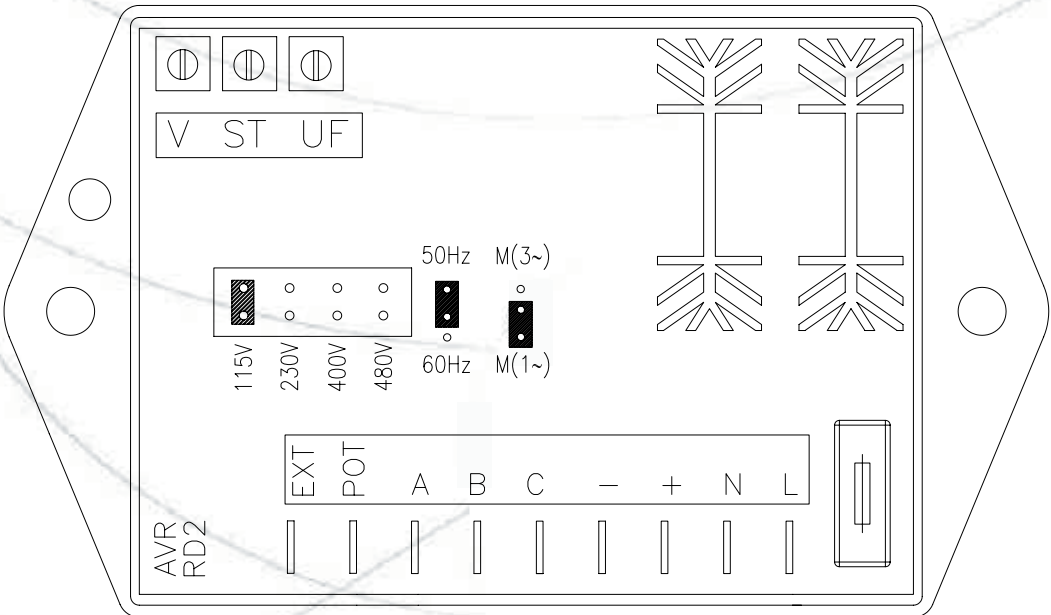




AVR RD2



INTRODUCTION

The RD2 is a digital voltage regulator designed for 50/60 Hz brush and brushless generators. It regulates the output voltage of a generator by controlling the field current. The modular architecture enables optimisation for different applications. It has single and three phase sensing.

DESCRIPTION

The voltage regulator controls and keeps constant the average value of the 3RMS phase voltages. A frequency control progressively deactivates the machine when the drive motor speed drops below a pre-set adjustable threshold preventing over-excitement at low operating speeds.

ELECTRICAL CHARACTERISTICS AND BASIC PERFORMANCE

The electronic is sealed with resin (it is a perfect protection against vibration and dropping). The regulator includes:

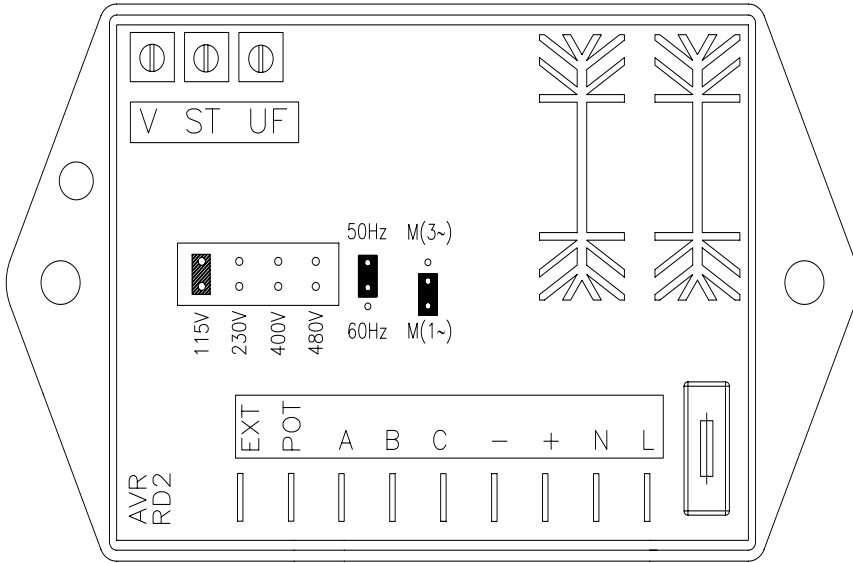
- A terminal strip (9 terminals)
- A voltage trimmer
- A stability trimmer
- An under frequency trimmer
- A range sensing selection jumper
- A frequency selection jumper
- A sensing selection jumper (single/three-phase)
- Electric protection with fuse

MAIN CHARACTERISTICS

- Safety: the regulator is designed to not create hazardous conditions (direct contact, indirect contact, power surges).
- Accuracy: contained within the limits of $\pm 1\%$ (from no load to 100% load, PF = 0.8 to 1).
- Electromagnetic compatibility: with proper external filters is according EC directives.
 - Emission according EN 61000-6-3 (residential application).
 - Immunity according EN 61000-6-2 (industrial application).
- Operating temperature: from -20°C to $+60^{\circ}\text{C}$
- Underspeed: The AVR protects the generator from underspeed operation. The output voltage starts to decrease from 45 ÷ 46Hz (55 ÷ 56Hz) adjustable.
- Excitation: The AVR can ensure the self excitation of the alternator using the residual magnetism. The excitation process happens without surges regardless of starting time.
- Response time: after the insertion and disconnection of full load PF = 0.8, the voltage returns to the nominal values with a time of less than 0.3 s. without over / under abnormal voltages.
- Resistance to short circuit: the regulator is able to withstand the short circuit (both three-phase, or phase-phase, or phase to neutral) without damages.
- Connection: all connection to the AVR are made with 6.3mm female fast-on terminal.
- Coating: the AVR is completely covered with resin and it is comply with RoHS directive.

CONFIGURATION JUMPERS

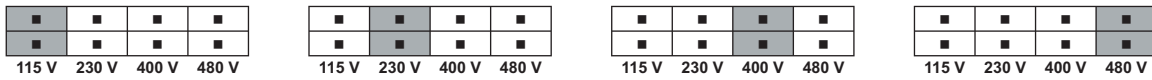
The regulator has three groups of jumpers.



The first group of jumpers selects the nominal voltage of sensing.

- 115 Vac;
- 230 Vac;
- 400 Vac;
- 480 Vac.

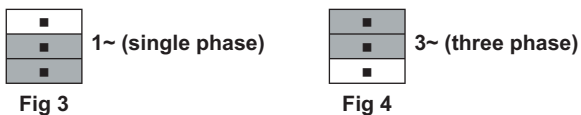
Example of jumper position



The second group of jumper, which is identified by letter Hz, refers to the operation of the alternator at 50 or 60 Hz (fig.1/fig.2).



The third group identifies the type of sensing, single phase (1~) or three phases (3~) (fig.3/fig.4).



REGULATION OF VOLTAGE, STABILITY AND UNDER FREQUENCY

VOLTAGE ADJUSTMENT

Adjusting the trimmer “V” changes the output voltage. Take the generating set to its nominal speed and turn until the required voltage is obtained. If a small variation in speed causes a voltage variation, then the underspeed protection trimmer “UF” should first be calibrated.

Adjusting the “V” trimmer, the ranges are the following:

- jumper on 115 V position, range 100÷130 V;
- jumper on 230 V position, range 185÷245 V;
- jumper on 400 V position, range 340÷460 V;
- jumper on 480 V position, range 440÷520 V.

UNDER FREQUENCY ADJUSTMENT

Set the frequency selection jumper at 50 (60)Hz.

Start up rotation of the generating set adjusting it to obtain a frequency of 46 (56)Hz. Turn trimmer “UF” until the voltage begins to drop. Restore nominal speed.

Caution: if the UF protection is adjusted at too low values the generator may be damaged. On the other hand, too high adjustments can cause voltage drops with high loads.

UF trimmer is a single potentiometer turn. The adjustment range is:

- jumper on 50 Hz position, range 42÷50 Hz, the central position of trimmer corresponds to 46 Hz;
- jumper on 60 Hz position, range 52÷60 Hz, the central position of trimmer corresponds to 56 Hz.

STABILITY ADJUSTMENT

If there are voltage fluctuations, adjust the potentiometer “ST”, which modulates the reaction time of the regulator to external inputs, thereby eliminating any instability in the alternator-load system.

CONNECTING AN EXTERNAL POTENTIOMETER (5 kOhm)

Remote voltages adjustment : connect the external potentiometer (5kOhm, ½W) to the free terminals “EXT POT”.

EXT POT can only reduce the original set point of the AVR. To increase the voltage setting it is necessary to turn the EXT POT completely anticlockwise (min. resistance) and then to adjust the max limit with “V” potentiometer.

CONNECTIONS

The Output (DC field connection):

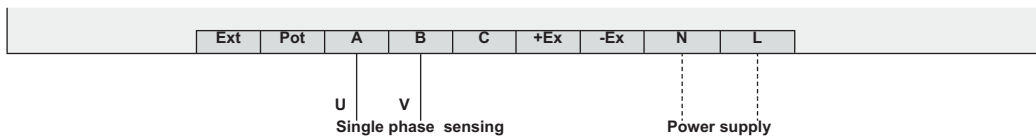
- At terminals “+Ex” (red wire) and “-Ex” (black wire),

The power supply has to be connected:

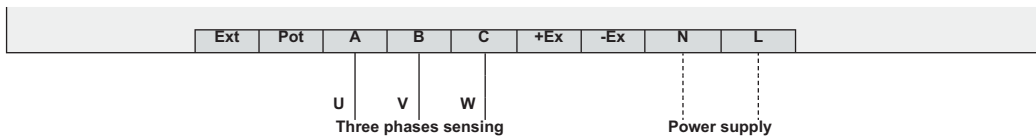
- At terminals “N” (neutral) and “L” (line/phase). The power can be supplied by using an independent auxiliary windings, integrated in the alternator stator, or the phase of sensing. The maximum voltage input is 340 V. The L line is protected by fuse (type 3.15 A, 250 V, 5x20).

For the 3Ph alternator the voltage reference must be connected:

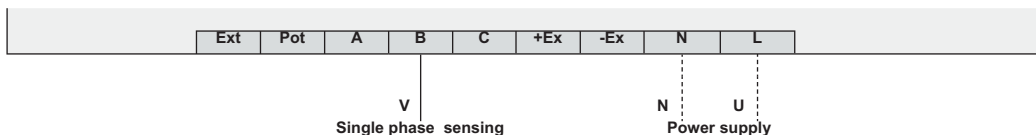
Single-phase sensing and power supply with independent auxiliary windings:
at terminals A and B the sensing, at terminals AuxN and AuxL the power supply.



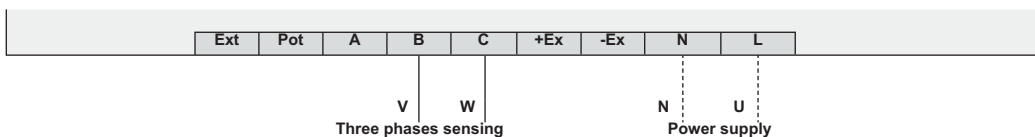
Three-phases sensing and power supply with independent auxiliary windings:
at terminals A, B and C the sensing, at terminals AuxN and AuxL the power supply.



Single-phase and power supply without auxiliary windings:
at terminal B the sensing, at terminals AuxN and AuxL the power supply.



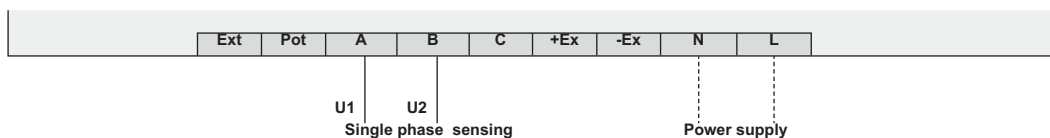
Three-phase sensing and power supply without auxiliary windings:
at terminals B and C the sensing, at terminals AuxN and AuxL the power supply.



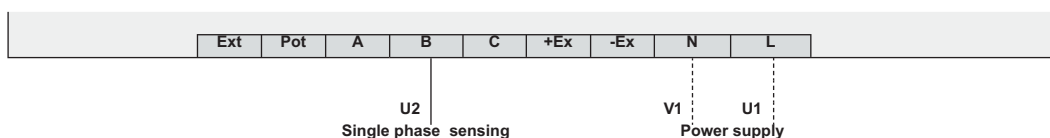
U-V-W are the three phases of the alternator.
N is the neutral.

For the 1Ph alternator the voltage reference must be connected:

Single-phase sensing and power supply with independent auxiliary windings:
at terminals A and B the sensing, at terminals AuxN and AuxL the power supply.



Single-phase sensing and power supply without auxiliary windings:
at terminal B the sensing, at terminals AuxN and AuxL the power supply.



U1-V1 are the output of the alternator (230V).

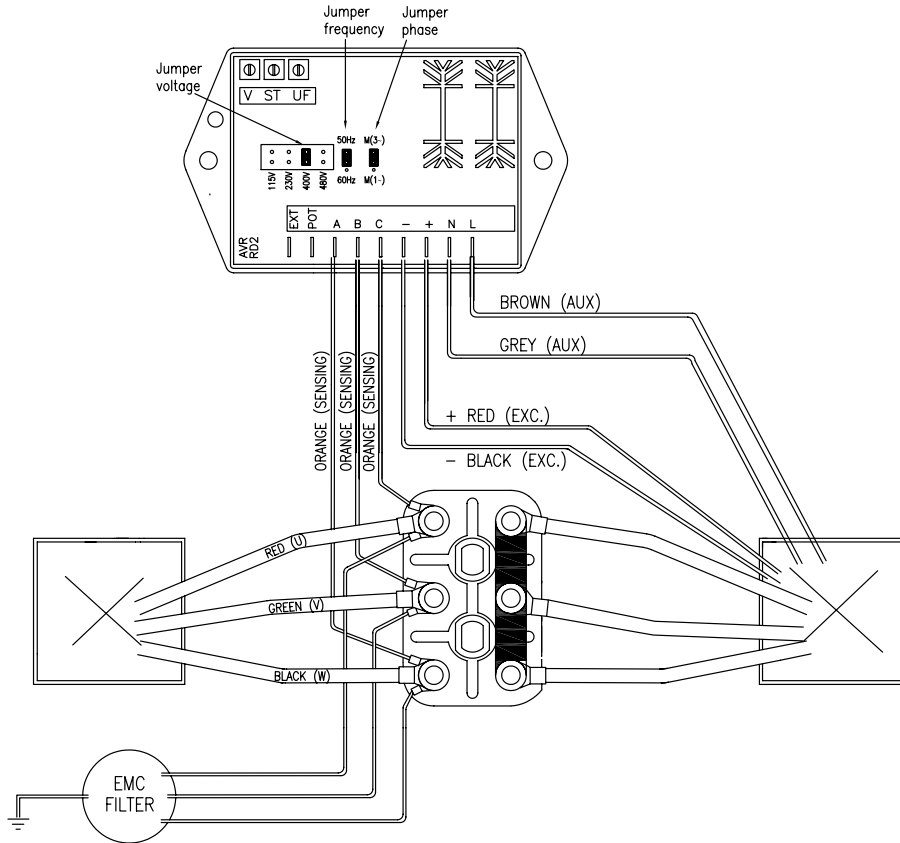
U1-U2 is half phase (115V).

The external voltage potentiometer:

- At terminals "Ext" and "Pot".

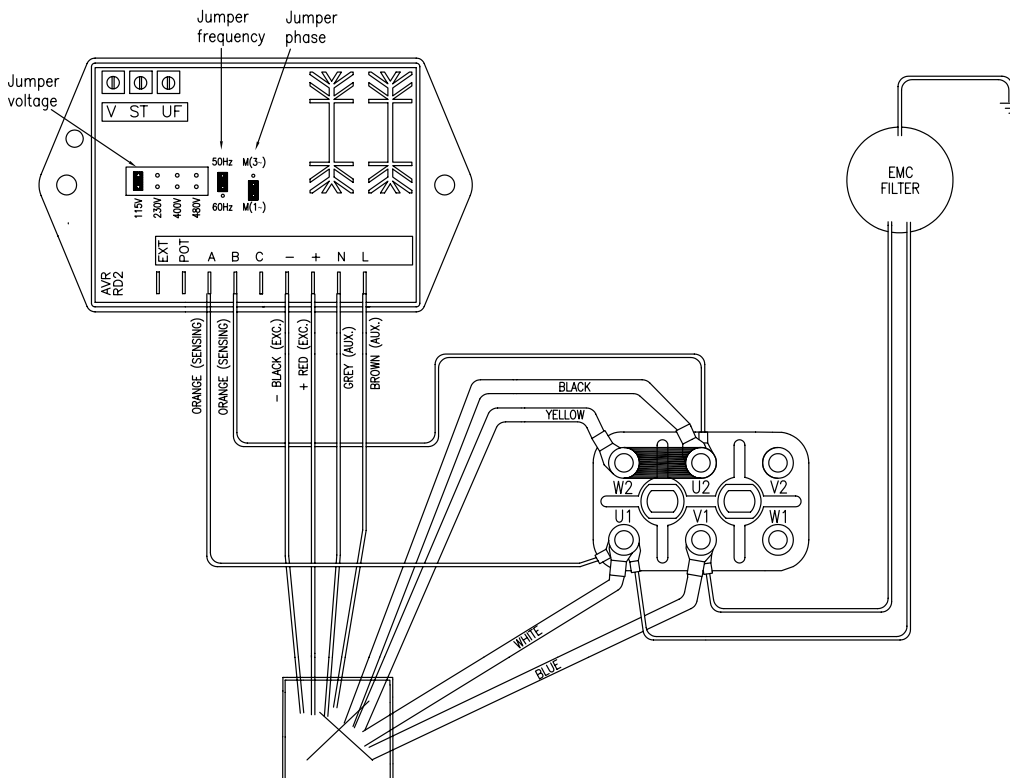
WIRING DIAGRAM OF 3Ph ALTERNATOR SENSING 3Ph WITH AUXILIARY WINDINGS

WIRING DIAGRAM OF AVR RD2 SENSING 3Ph



WIRING DIAGRAM OF 1Ph ALTERNATOR WITH AUXILIARY WINDINGS

WIRING DIAGRAM OF AVR RD2 SENSING 1Ph





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