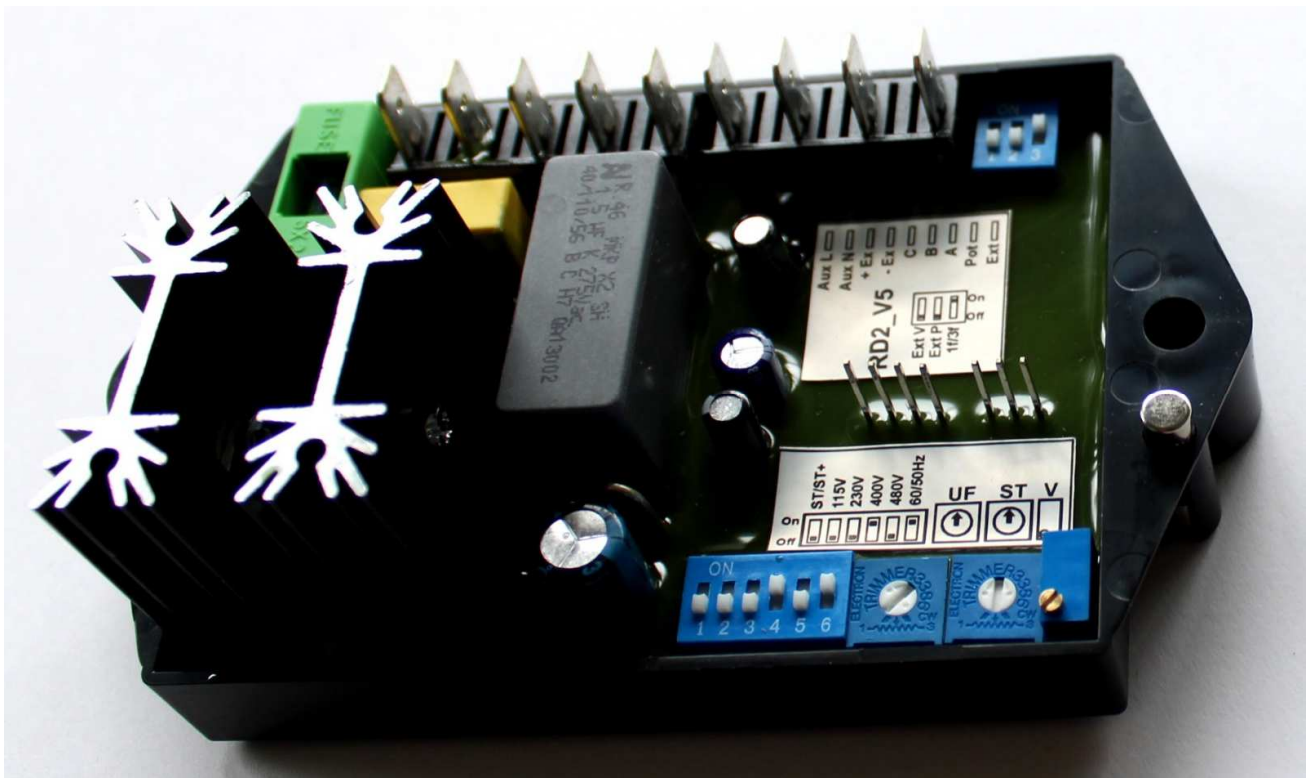


RD2 Digital AVR

Automatic Voltage Regulator

OPERATION MANUAL



REV01 07/2019



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GENERAL FEATURES

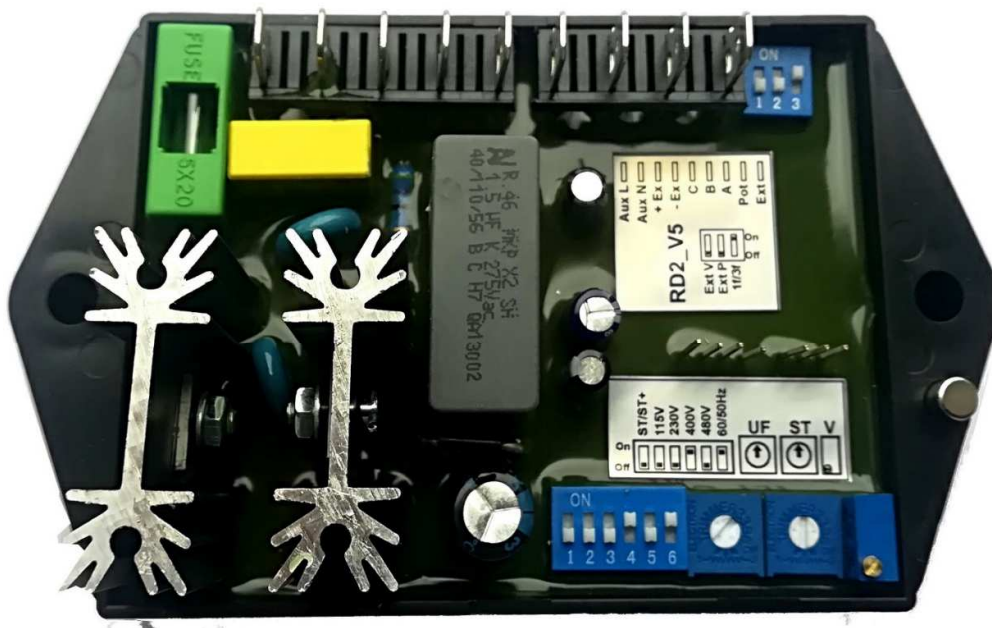
SINCRO RD2 is a digital voltage regulator designed for 50/60 Hz brushless generators.

It regulates the output voltage of a generator by controlling the field current. It has single and three phase sensing.

The RD2 controls and keeps constant the average value of the 3RMS phase voltages.

A frequency measuring circuit continually monitors the alternator output and provides output under-speed protection of the excitation system, by reducing the output voltage proportionally with speed below a pre-settable threshold. A manual adjustment is provided for factory setting of the under frequency roll off point, (UF). This can easily be changed to 50 or 60 Hz with the dip-switch.

Provision is made for the connection of a remote voltage potentiometer, allowing the user fine control of the alternator's output.



ELECTRICAL SPECIFICATIONS

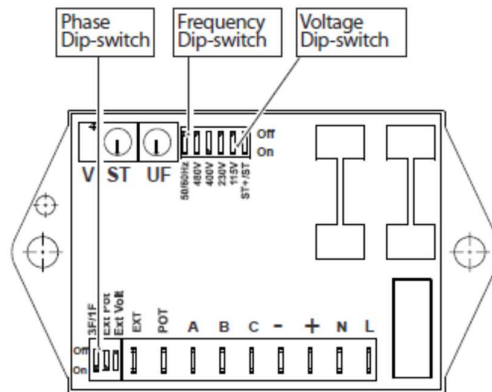
RD2 AVR includes:

- A terminal strip (9 terminals)
- A voltage trimmer
- A stability trimmer
- An under frequency trimmer
- A range sensing selection dip switches
- A frequency selection dip switch
- A stability range selection dip switch
- A sensing selection dip switch (single/three-phases)
- An external pot setting output selection dip-switch
- An external voltage setting output selection dip-switch
- Electric protection with fuse

The electronic is sealed with resin (it is a perfect protection against vibration and humidity).

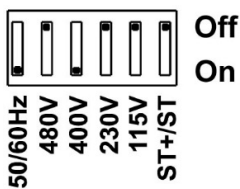
DIP-SWITCHES CONFIGURATION

RD2 AVR has 2 groups of DIP-Switches:

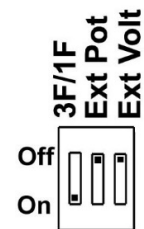


The first group (group 1) of DIP-Switches selects:

- the stability
 - normal stability (ST)/improved stability (ST+)
- the nominal voltage of sensing
 - 115 Vac
 - 230 Vac
 - 400 Vac
 - 480 Vac
- The working frequency
 - 50 Hz or 60 Hz



Dip-switch group 1



Dip-switch group 2

The second group (group 2) of DIP-Switches selects:

- The possibility to set generator output by External voltage (Ext V, ON)
- The possibility to set generator output by External Potentiometer (Ext P, ON)
- 1F or 3F sensing.

ADJUSTMENTS

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 under-speed protection trimmer "UF" should first be calibrated.

Adjusting the "V" trimmer, the ranges are the following:

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

UNDER FREQUENCY KNEE ADJUSTMENT

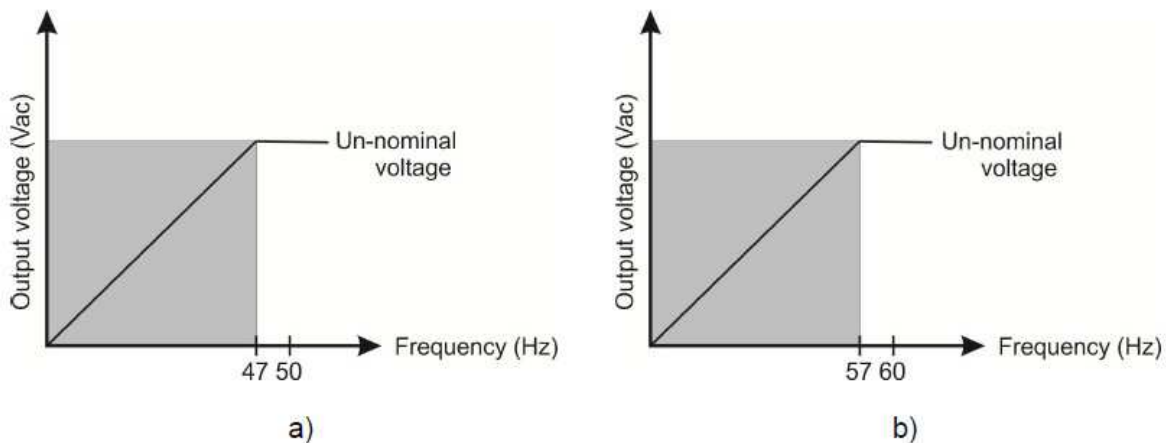
AVR RD2 incorporates an under-speed protection circuit (UF) which gives a volts/Hz characteristic when the alternator speed falls below a presettable threshold known as the "knee" point.

The UF knee adjustment is preset at factory at the 47Hz on a 50Hz system or 57Hz on a 60Hz system. Selection of 50 / 60Hz can be made using the DIP-Switches.

The figures below show the curves for voltage variation as a function of frequency variation.

For nominal frequency operation, UF is disabled. When rotation decreases (e.g. when shutting down), excitation decreases, reducing the output voltage of the alternator.

The pre-set "knee" point can be altered, by UF trimmer, according to the needs of each application.



Under frequency "knee": a) 50 Hz system, b) 60 Hz system

UF trimmer is a single potentiometer turn.

The adjustment range is:

- DIP-Switch on 50 Hz position, range 42÷50 Hz, the central position of trimmer corresponds to 46 Hz
- DIP-Switch 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. The stability can be adjusted in two ranges: normal stability (ST) and improved stability (ST+) selecting the ranges by DIP-switch (ST/ST+) from group 1 switches.

CONNECTING AN EXTERNAL POTENTIOMETER (5 kOhm)

Remote voltages adjustment: Put the DIP-switch “Ext pot” (group 2 dip switches) to ON position, and “Ext Volt” to OFF position. Connect the external potentiometer (5kOhm, ½W) to the free terminals “EXT POT”.

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

CONNECTING AN EXTERNAL VOLTAGE (0-10 Vdc) FOR PARALLEL DEVICE

Put the DIP-switch “Ext voltage” (group 2 dip switches) in ON position, and “Ext Pot” to OFF position. Connect the minus voltage (-) to the free terminal “EXT” and the plus voltage (+) to the free terminal “POT”. To adjust the range, put V trimmer in max CCW position. Connect half of voltage range (5 Vdc) on “EXT” “POT” input. With V trimmer adjust alternator voltage to the nominal value.

CONNECTIONS

Output (DC field connection):

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

Power supply has to be connected:

- At terminals “N” (neutral) and “L” (line/phase).

Power can be supplied by using an independent auxiliary winding, integrated in the alternator stator, or the phase of sensing.

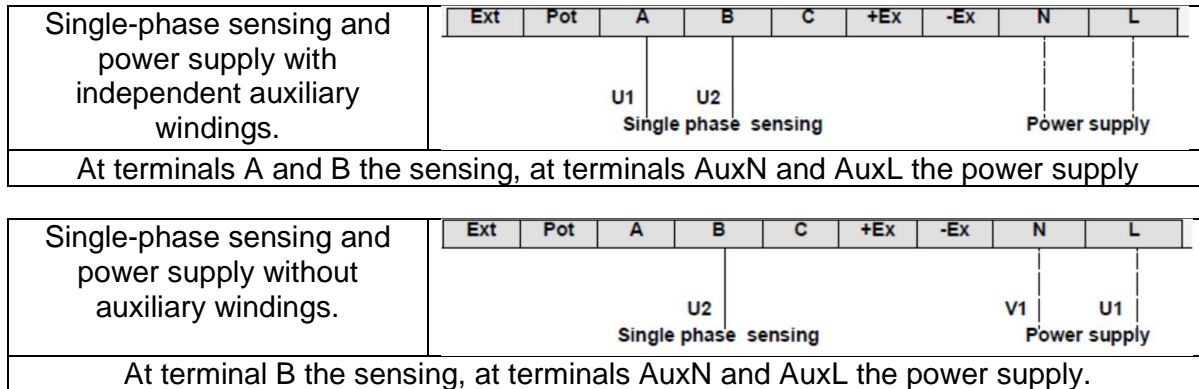
The L line is protected by fuse (type F3.15 A, 250 V, T 5x20).

For the 3-phase alternator the voltage reference must be connected as follows:

Single-phase sensing and power supply with independent auxiliary windings.	<table border="1"> <thead> <tr> <th>Ext</th> <th>Pot</th> <th>A</th> <th>B</th> <th>C</th> <th>-Ex</th> <th>+Ex</th> <th>N</th> <th>L</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>U</td> <td>V</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="4" style="text-align: center;">Single phase sensing</td> <td colspan="5" style="text-align: center;">Power supply</td> </tr> </tbody> </table>	Ext	Pot	A	B	C	-Ex	+Ex	N	L			U	V						Single phase sensing				Power supply				
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U-V-W are the three-phases voltage of the alternator. N is the neutral

For the 1-phase alternator the voltage reference must be connected as follows:



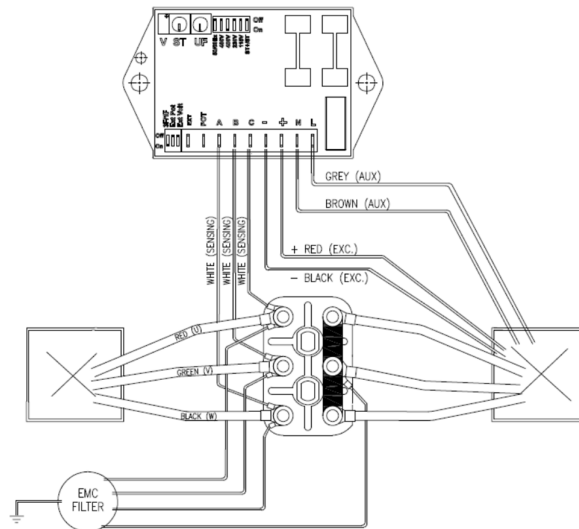
U1-V1 are the output of the alternator (230 V)
 U1-U2 is half phase (115 V)

U1-V1 are the output of the alternator (230V).
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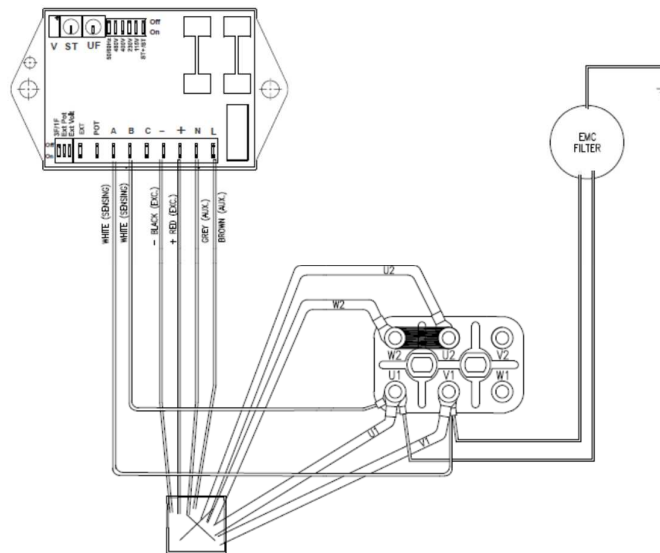
The external voltage potentiometer:
 - At terminals "Ext" and "Pot".

WIRING DIAGRAMS

AVR RD2 SENSING 3PH



AVR RD2 SENSING 1PH



STARTING UP

If a replacement AVR has been fitted, or the re-setting of the voltage adjustment is required, please proceed as follows:

1. Connect the wires coming from the alternator according to the description in the CONNECTION DIAGRAM and the type of alternator to be used.
2. Check that the DIP switches group 2 and group 1 are consistent with the characteristics of the machine (voltage, frequency, remote control)
3. Before running alternator, turn the volts trimmer "V" anti-clockwise
4. Turn stability trimmer "ST" to midway position
5. Start alternator set, and run on no load at nominal frequency e.g. 50-53 Hz or 60-63 Hz
6. Carefully turn volts trimmer "V" (or external pot, if fitted) clockwise until rated voltage is reached
7. If instability is present at rated voltage, refer to stability adjustment, and then re-adjust voltage if necessary

MAINTENANCE AND TROUBLE-SHOOTING

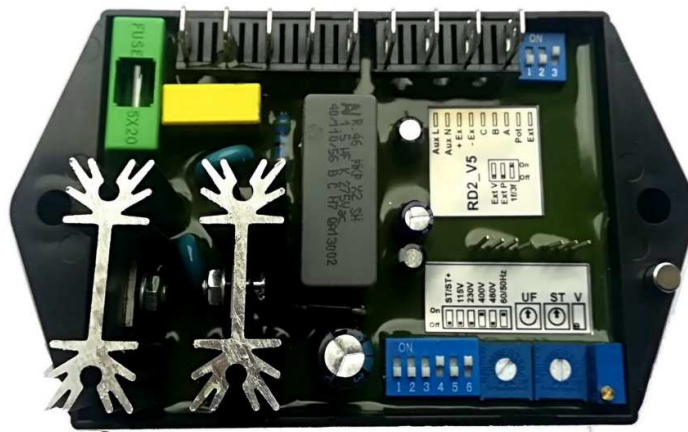
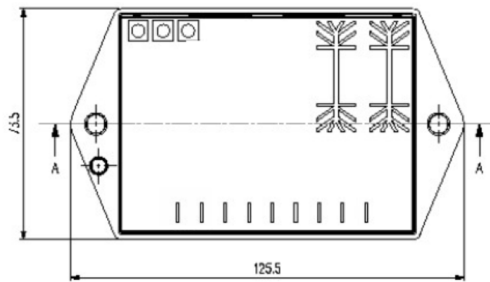
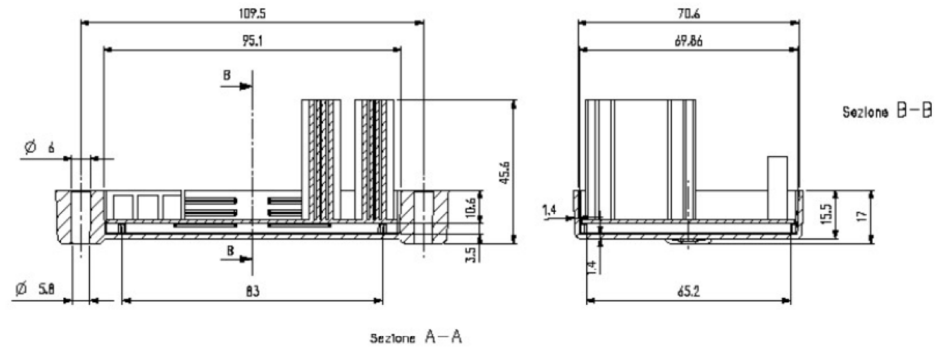
PREVENTIVE MAINTENANCE

Periodical inspections of the equipment are required to ensure they are clean, dust and moisture free. It is essential that all terminals and connections are kept free from corrosion.

TROUBLE-SHOOTING

Trouble	Possible causes	Solutions
NO OUTPUT VOLTAGE	<ul style="list-style-type: none"> - Demagnetized machine - Wrong connection of the AVR - Loose terminals/connections - External potentiometer doesn't work (if present) - Burnt fuse - Faulty AVR 	<ul style="list-style-type: none"> - Connect (for a while) an external battery (12Vdc) to the exciter (respecting the polarities) - Check as per wiring diagram - Check if all terminals/connections are well tightened - Change external potentiometer (if present) - Check and replace - Replace the AVR
LOW OUTPUT VOLTAGE	<ul style="list-style-type: none"> - Voltage potentiometer wrongly adjusted - Sensing wrongly connected - Dip-switch wrongly positioned - Low frequency (under the UF limit) - Under-Frequency protection is not properly adjusted - Faulty AVR 	<ul style="list-style-type: none"> - Check and adjust - Check the sensing connections - Check and fix - Increase the engine speed - Check and adjust - Replace the AVR
HIGH OUTPUT VOLTAGE	<ul style="list-style-type: none"> - Voltage potentiometer wrongly adjusted - Sensing wrongly connected - Dip-switch wrongly positioned - Missing sensing - Faulty AVR 	<ul style="list-style-type: none"> - Check and adjust - Check the sensing connections - Check and fix - Check if sensing is interrupted - Replace the AVR
UNSTABLE VOLTAGE	<ul style="list-style-type: none"> - Stability response incorrectly adjusted - Unstable engine speed - Loose terminals/connections - Faulty AVR 	<ul style="list-style-type: none"> - Adjust trimmer "ST" - Check the frequency/engine speed - Check if all terminals/connections are well tightened - Replace the AVR
FUSE BLOWS CONTINUOUSLY	<ul style="list-style-type: none"> - UF protection adjusted for a very low frequency (so the fuse burn during the turn-off procedure) - Faulty AVR 	<ul style="list-style-type: none"> - Adjust UF limit to a value close to the nominal frequency - Replace the AVR

DIMENSIONS





CHALLENGE THE OUTSIDE

SINCRO IS INSIDE

SINCRO has been manufacturing trustable alternators for over 30 years.
At the core of your best energy up to 2.6 MVA. Standard and custom.
Proudly 100% Made in Europe.



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