

SmartGen

MAKING CONTROL SMARTER

SVR460

Automatic Voltage Regulator

USER MANUAL



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Table 1 Software Version

Date	Version	Content
2024-06-12	1.0	Original release.

Table 2 Notation Clarification

Sign	Instruction
 NOTE	Highlights an essential element of a procedure to ensure correctness.
 CAUTION!	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
 WARNING!	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.

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1 OVERVIEW

The **SVR460 Automatic Voltage Regulator** is a half-wave phase-controlled thyristor type automatic voltage regulator (AVR), which is part of the excitation system for the brushless AC generator.

In addition to regulating the voltage of the generator, AVR also has a low-speed protection function to ensure safe and reliable control of the generator. The power of excitation is directly supplied by the output terminal of the generator.

The power supply circuit of AVR uses high efficiency semiconductors to obtain the excitation voltage from the remanence.

The AVR is connected to both the main stator winding and the excitation winding and provides closed-loop control accuracy of $\pm 1\%$ for the output voltage.

Apart from obtaining power from the main stator, AVR also obtains sample voltage from the output winding to achieve control over the output. The AVR controls the current output to the excitation system based on the sampled data, and the host controller controls the output voltage within a certain range by compensating for motor load, speed, temperature, and power factor.

The frequency measurement circuit continuously monitors the motor output, and when the generator speed drops below a preset value, low-speed protection is provided by reducing the output voltage proportionally to the speed. The under frequency protection set point can be changed by adjusting the under frequency protection (UFRO) potentiometer. The 50Hz or 60Hz mode can be easily selected by connecting relevant terminals with jumpers.

Connection terminals are provided for remote voltage regulating trimmer, allowing users to achieve precise control of the generator output voltage.

2 SPECIFICATIONS

Table 3 Technical Parameters

Item	Content
Input	Voltage: 85Vac – 125Vac 170Vac – 250Vac (It can be selected by jumper connection)
	Frequency: 50Hz-60Hz (Nominal)
	Phase: 1
	Wire: 2
Output	Voltage: Max.90Vdc @ 207Vac Input
	Current: Continuous 4A, and transient 6A for 10 seconds
	Field Resistance: Min. 15Ω
Regulation	±1.0% (See details in the NOTE below the table)
Thermal Drift	1% drift for 40°C change of AVR ambient temperature after working 10 minutes
Typical System Response	90% Field Current 80ms
	97% Voltage Output 300ms
External Voltage Adjustment	With the 1kΩ per watt trimmer
	Voltage Adjustment Range: ≥±5%
Under Frequency Protection	Set potion: 92%–94% rated frequency
	Slope: 170% under 30Hz
AVR Loss	Maximum loss: 10W
Excitation Voltage	3.5Vac @ AVR input
Environment	Vibration: 20Hz–100Hz, 50mm/sec, 100Hz–2kHz, 3.3g
	Relative Humidity: 0°C–70°C, 95%RH
	Working Temperature: -40°C ~+70°C
	Storage Temperature: -55°C ~+80°C
Overall Dimensions	105mm x 140mm x 38mm
Installation Dimensions	80mm x 115mm x Ø5–4
Color	Black
Weight	300g

NOTE: It is within the 4% engine governing range.

3 DESCRIPTION OF CONNECTION TERMINALS

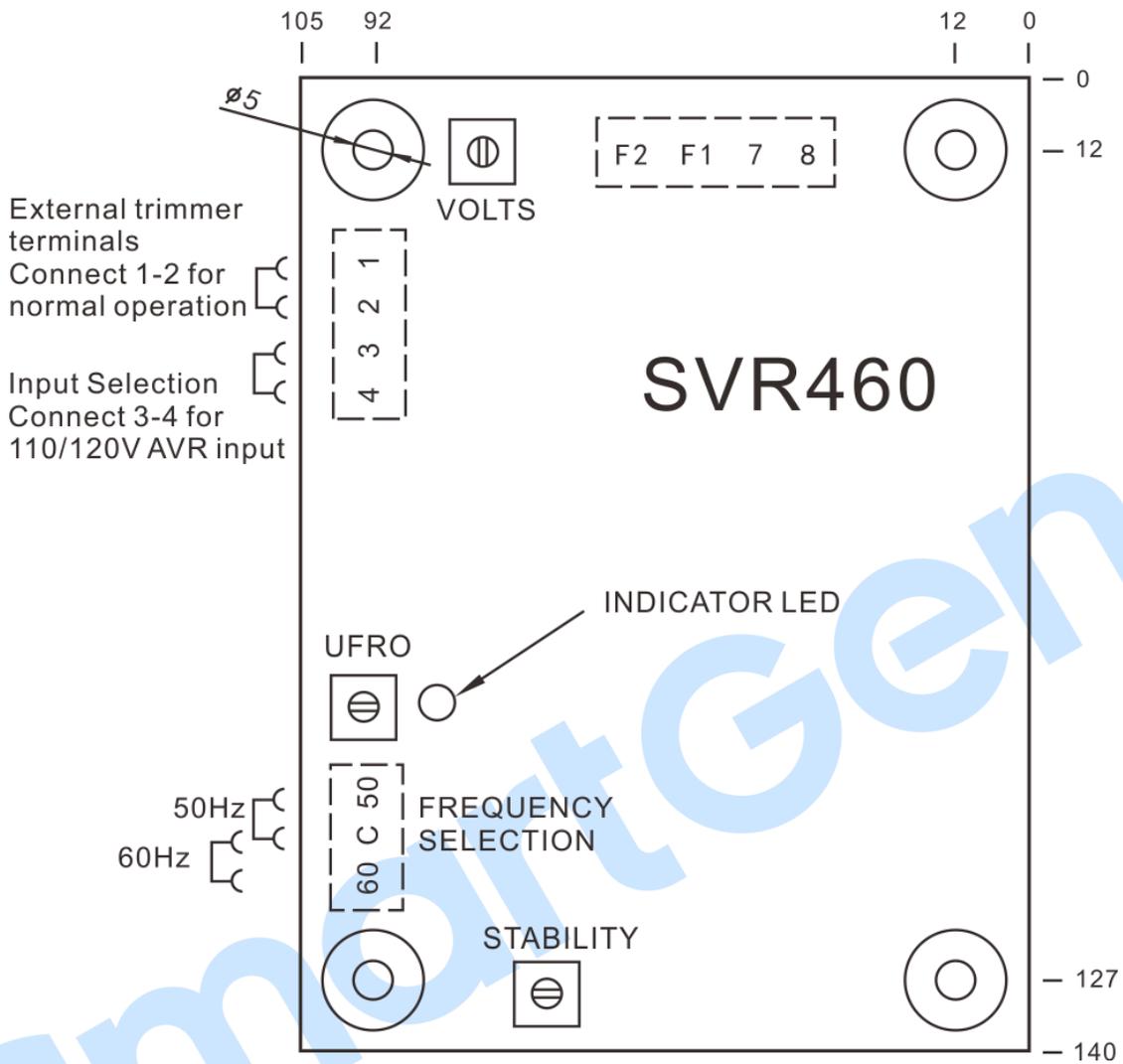


Fig.1 SVR460 Schematic Diagram

Table 4 Description of Connection Terminals

No.	Function
F2	Excitation output, F1 is the positive and F2 is the negative.
F1	
7	COM grounding terminal.
8	Sensing input.
1	Manual trimmer (if installed). Remove the wiring connection between 1 and 2, two-core insulative shielded cable is recommended, and the shield layer should be connected with the Terminal 2 of AVR. Connect the 1 and 2 for normal operation.
2	
3	Input selection, connect the 3 and 4 when the input voltage is 110V/120V.
4	
60	Frequency selection. Connect C-50 to select 50Hz, and connect C-60 to select 60Hz.
C	
50	

4 CONNECTION BETWEEN AVR AND GENERATOR

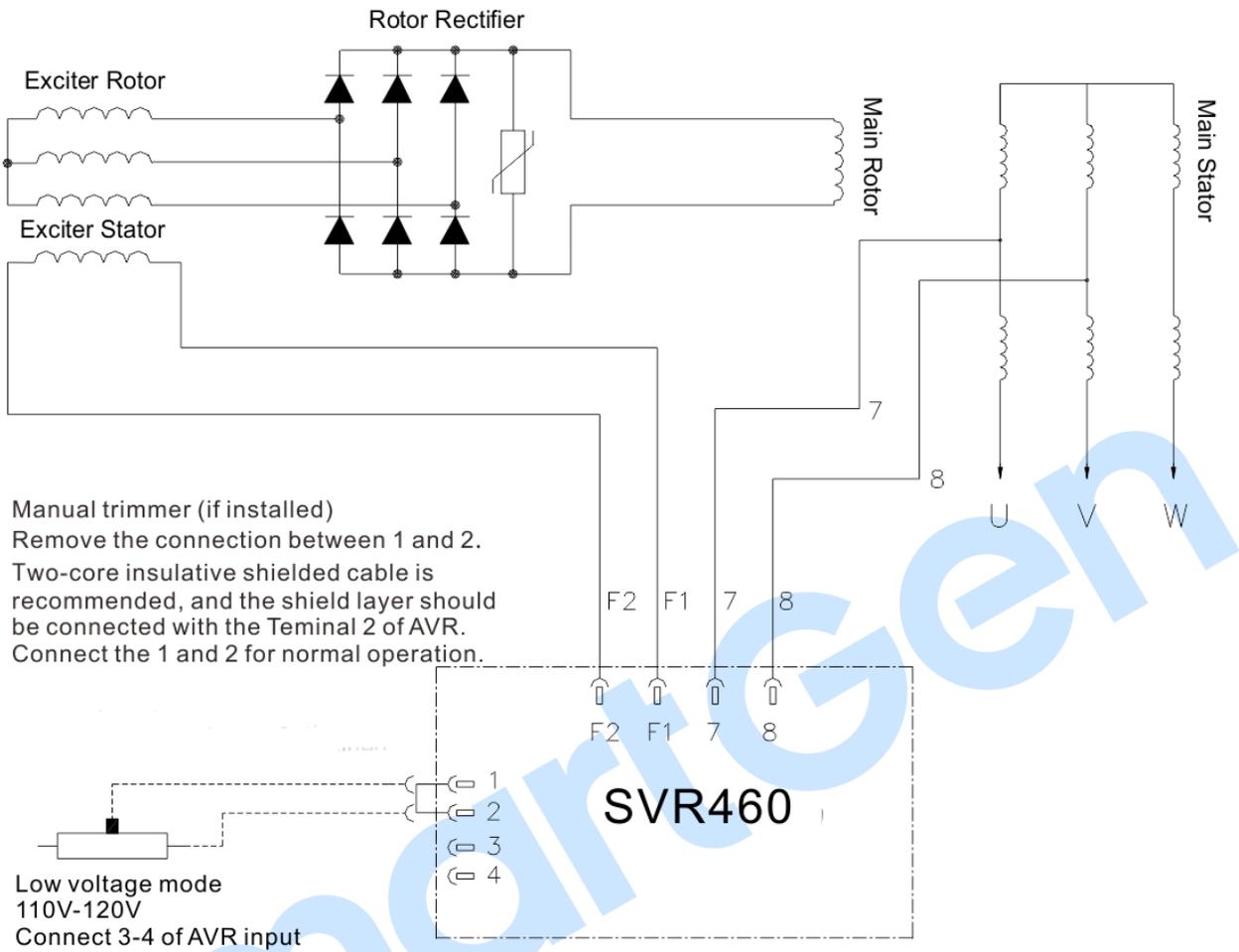


Fig.2 Wiring Diagram between AVR and Generator

5 DESCRIPTION OF CONTROL

Table 5 Description Of AVR Control

Controller	Function	Description
Voltage	To adjust generator output voltage	Turn it clockwise to increase output voltage
Stability	To prevent voltage hunting	Turn it clockwise to increase stability
UFRO	To set the knee point of under frequency roll off	Turn it clockwise to reduce the knee point frequency

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6 ADJUSTMENT OF AVR

6.1 VOLTAGE ADJUSTMENT

The output voltage of the generator is set before the factory deliver and it can be adjusted by the voltage potentiometer on the AVR or an external voltage regulating trimmer.

If an external voltage regulating trimmer is not required, connect the Terminal 1 and 2 on the AVR. Connect the Terminal 3 and 4 under low voltage mode (110V or 120V).

6.2 VOLTAGE ADJUSTING STEPS

When replacing the AVR or a large adjustment is necessary, please follow the voltage adjusting steps below.

- a) Turn the voltage potentiometer counterclockwise to the end before starting the generator;
- b) If the AVR is connected with a remote voltage regulating trimmer, turn the voltage potentiometer to the middle position;
- c) Then turn the stability selection potentiometer to the middle position;
- d) Connect a appropriate voltmeter (0Vac-300Vac) with the L-N of generator;
- e) Start the generator set, run the generator with no load at the nominal frequency, such as 50Hz-53Hz or 60Hz-63Hz;
- f) If the red LED indicator flashes, refer to the under frequency protection (UFRO) adjustment;
- g) Turn the voltage potentiometer clockwise carefully until the rated voltage;
- h) If the voltage is unstable, refer to the stability adjustment. Adjust the voltage again if necessary;
- i) Voltage adjustment is completed.

6.3 STABILITY ADJUSTMENT

The AVR is equipped with a stability or damping circuit to ensure good steady-state performance and transient performance of the generator.

To find the correct set point, start the generator under no load, rotate the stability potentiometer counterclockwise slowly until the voltage begins to become unstable.

The appropriate stable point should be slightly clockwise away of the unstable point (that is, the voltage is in the stable range but very close to the unstable range).

6.4 UNDER FREQUENCY PROTECTION ADJUSTMENT

The AVR has an internal under frequency protection circuit that sends out a volts/Hz ratio when the generator's speed drops below a set value (knee point).

The red LED indicator flashes, that means the under frequency protection circuit is starting to work.

The under frequency protection adjustment is preset in the factory and sealed, and users only need to select the jumper connection for 50Hz/60Hz.

Once it is correctly set, the LED indicator will flash immediately when the frequency is below the set value.

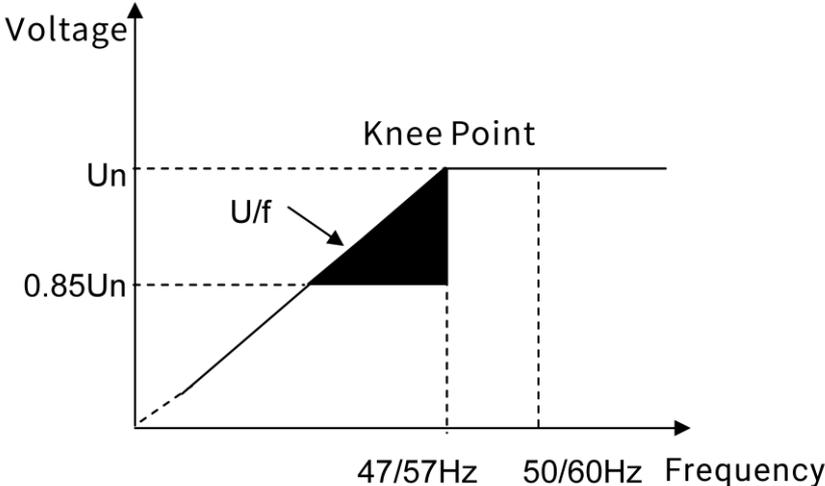


Fig.5 Under Frequency Protection

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7 OVERALL DIMENSIONS

Unit: mm

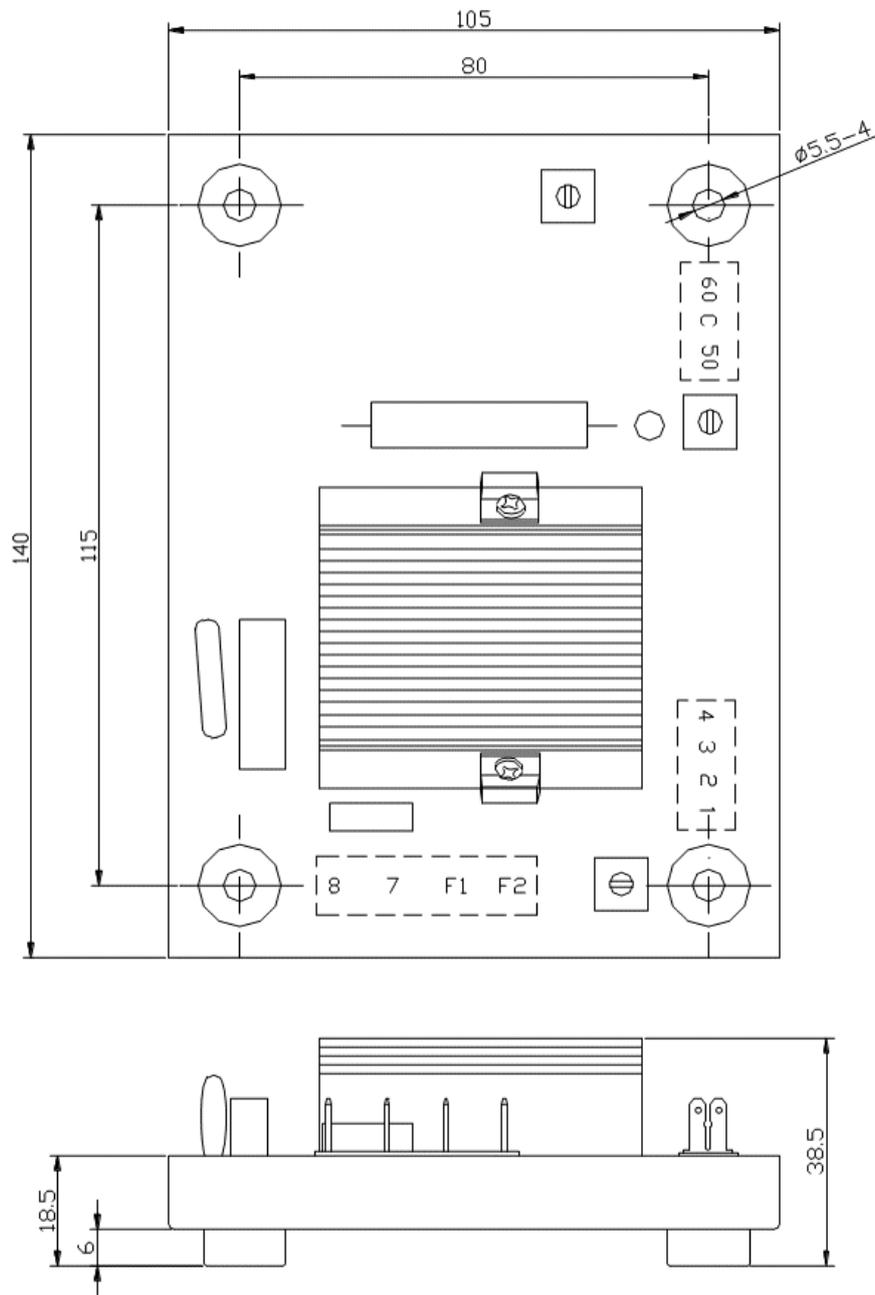


Fig. 6 Overall Dimensions