

A3

Manual and Instruction SM Alternators



Sinocox Electro-Mechanical(Fuzhou) Co., Ltd. AC. Generator Warranty

Dear Guests,

Firstly, thank you very much for choosing our new designed AC. Brushless generator for your Gensets. We'd like commit following warranty for better use.

WARRANTY PERIOD: The Warranty Period is eighteen months from the date when the goods have been notified as ready for delivery or twelve months from the date of first commissioning (whichever is the shorter period).

DEFECTS AFTER DELIVERY: if any fault which under proper use appears in the generators within the warranty period specified, and is found on examination by us to be solely due to defective material and workmanship, We will make good by repair or, at our option, by the supply of a replacement after discussing with customers. Any part repaired or replaced, under warranty, will be delivered free of charge (via sea freight if outside the PRC).

For those defects which have not been properly installed in accordance with recommended installation practices as detailed in the publication 'Installation, Service and Maintenance Manual', or which have been improperly stored or which have been repaired, adjusted or altered by any person except ourselves or our authorized agents, or in any second-hand goods, proprietary articles or goods not of our own manufacture although supplied by us, we will be not liable for any expense and duty.

Any claim under this clause must contain fully particulars of the alleged defect, the model of the generators, S/N of generators (as shown on nameplate), and the name and address of the OEMs. For spare parts, the order reference under which the generators were supplied (please kindly see Appendix 1 for details).

Our liability shall be fully discharged by either repair or replacement as above, and in any event shall not exceed the current list price of the defective generators.

Our liability under this clause shall be in lieu of any warranty or condition implied by law as to the quality or fitness for any particular purpose of the generators, and save as expressly provided in this clause we shall not be under any liability, whether in contract, tort or otherwise, in respect of defects in generators delivered or for any injury, damages or loss resulting from such defects or from any work undone in connection therewith.

Sinocox Electro-Mechanical(Fuzhou) Co., Ltd.

8th Dec, 2011

SAFETY PRECAUTIONS:

Thank you very much for choosing our AC. Brushless generators. Before you assemble or start generators, please read this manual, obey all Warnings and Cautions, and become familiar with the generators.

SAFEY LABELS INSTRUCTION:

The various safety labels will be indicated in this manual appropriate position by following format in order to remind or warning for better understanding and using generators to avoid any damage or injury.



Information that draws attention to the risk of damage to the product, process or surroundings.



Information that draws attention to the risk of injury or death.



Information that draws attention to the risk of electrocution.

SKILL REQUIREMENTS FOR PERSONNELS:

Service and maintenance procedures should only be carried out by experienced and qualified engineers. Before any intrusive procedures are carried out, ensure that the engine is inhibited and the generator is electrically isolated.

ELECTRICAL EQUIPMENTS:

We sincerely remind you that al electrical equipment can be risky if not operated correctly. Always service and maintain the generator in accordance with this manual.

Remark: based on our policy of continuous improvement, details in this manual which were correct at time of going to print and may now be due for amendment. Information included must therefore not be regarded as binding.

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SM Alternator

Sinocox designs, manufactures and markets the brushless alternators which comply with the main national (GB755) and international standards (IEC).

1. Application

1.1 Environment Protection: SM alternator is designed for standard IP23 degree and especially used for following situation:

Ambient Temp. $\leq 40^{\circ}\text{C}$, Ambient Humidity $\leq 90\%$, Altitude $\leq 1000\text{m}$

Please pay more attention that IP23 degree is not adequate protection for use outdoors without additional measures. Options for special protection are recommended depending on real operating environment. Please consult Sinocox for more details about IP Protection.

1.2 Airborne Contaminates: Contaminates such as salt, oil, exhaust fumes, chemicals, dust, sand, etc., will reduce the effectiveness of the insulation and lead to premature failure of the windings. Consider using air filters or a higher enclosure to protect the alternators.

1.3 Air Inlet Filter: Air filter is under request per customer order. As filter will restrict the air flow, there is power derating by 5% after applied filter

If the filters are supplied, factory fitted, the rating on the nameplate will include the reduced rating. The filters can be up-fitted after delivery in which case the customer must apply the power reduction.

Air filters remove airborne particulates above 3 microns. The frequency of changing and cleaning the filters depend on the site conditions. We recommend that the filters are monitored frequently until a suitable cycle of change is established.

Air filters do not remove water. Please ensure the filter is always dry, otherwise there may be some damage due to lower air inlet.

1.4 High Humidity environments: The humidity of the air will allow condensation to form on the windings if the temperature of the windings falls below the dew point, and impact the insulation of winding accordingly. In areas of high humidity, additional protection may be required.

1.5 Anti-condensation heaters: Anti-condensation heaters are designed to raise the temperature of the windings above the temperature of the surrounding material so that the condensation will not form on the windings. We strongly recommend that the best practice is to wire the heaters such that the heaters come on when the generator is switched off. This is particularly important in applications where high humidity is a significant problem. Always check the condition of the generators windings before switching the generator on. If moisture is observed carry out one or more of the drying-out methods outlined in chapter 4.1.

1.6 Bearing: SM alternator are fitted by Sealed for life bearings and type C3. The life of a bearing is complying with bearing manufacturer remark, but the life of bearing in service is subject to the working conditions and the environment. High levels of vibration from the engine or misalignment of the set will stress the bearing and reduce its service life. Very humid atmospheric or wet conditions can emulsify the grease causing corrosion and deterioration of the grease, leading to premature failure of the bearings.

We strongly suggest that end-user inspect bearing periodically under instruction of bearing supplier.

2. Installation

As the alternator is a very important part of Generator Set, please kindly read following instruction carefully so as to assemble Generator Set smoothly.

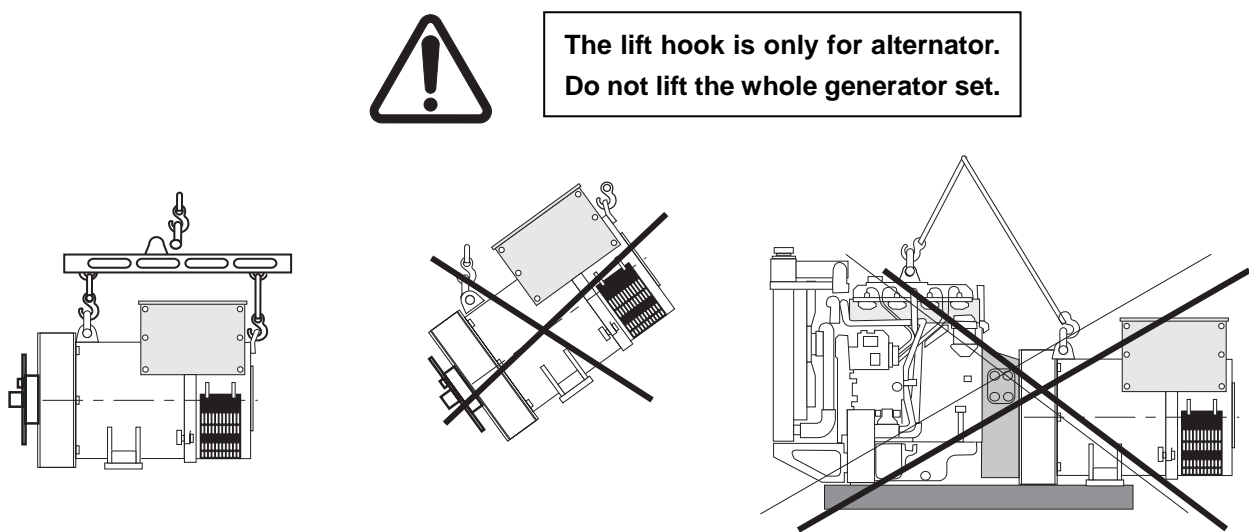
2.1 Delivery Check:

When you received alternator you ordered from Sinocox, please kindly check whether there is any damage due to transportation. If yes, please take a picture immediately and feedback forwarder, a copy is requested to send to Sinocox as record.

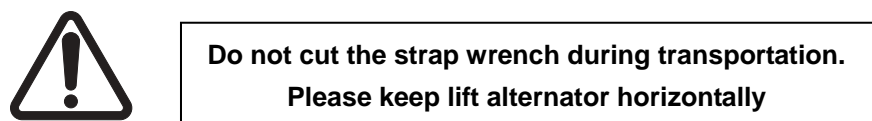
Please kindly check you received alternator nameplate and ensure it is same as your order description.

2.2 Handling the Alternator:

When lifting the alternator, please use a spreader bar to ensure that the angle on the lifting chains are vertical to the lifting position on the alternator to avoid any damage to the painting or others.



For single bearing alternator, the drive disc had been banded to flange with high intension strap wrench to avoid any touch between rotor and stator during the transportation. Please do not cut the strap wrench before you install the alternator with the engine.



2.3 Storage:

When you receive the alternator you ordered from Sinocox, if you will not use the alternator immediately, the alternator must be kept in a environment which suit following conditions:

- ☺ Clean and dry environment: when humidity above 90%, the insulation of alternator will be dropped; when humidity reaches 100%, the insulation almost achieve zero.
- ☺ If the alternator will be stored for a long time, please put the alternator into a closed space (such as packing by a Thermal shrinkage plastic film) with drier to avoid any condensation in the alternator.
- ☺ Please keep alternator away from vibration environment.

2.4 Single Bearing Coupling:

Considering transportation and storage, Sinocox special treated the drive disc by black oxide finish to avoid any rust and corrosion, and possible pollution due to re-cleaning drive disc.

Before assemble alternator and engine, please kindly check the dimension of flange and drive disc of engine and alternator. Alignment of single bearing generators is critical. If necessary, shim the generator feet to ensure alignment of the machined surfaces. Rotating the alternator rotor and engine crank shaft slowly and positioning the connection bolt during the rotation and lock it.

CAUTION

When assemble alternator and engine, please rotate engine flywheel to coupling drive disc. Do not rotate plastic fan.

2.5 Single Bearing Coupling Alignment.

- 1) On the engine, check the distance from the coupling mating face on the flywheel to the flywheel housing mating face to ensure that it match design requirement which is necessary to ensure that a thrust is not applied to the ac generator bearing or engine bearing.
- 2) Check that the bolts securing the flexible plates to the coupling hub are tight and locked into position. Please refer to Chapter 4.4 for detailed Torque value.
- 3) Remove air outlet covers from the drive end of the generator to gain access to coupling and adaptor bolts. Check that coupling joint interfaces are clean and lubricant free
- 4) Tighten bolts evenly around assembly sufficiently to ensure correct alignment.

2.6 Earth Arrangement

The alternator frame should be solidly bonded to the generating set baseplate. If anti-vibration mounts are fitted between the alternator frame and its baseplate, a suitably rated earth conductor should bridge across the anti-vibration mounts.



Follow local regulation to ensure that the correct earth requirements are applied.

2.7 Warning Labels

As we expect the set builder to paint the alternator in his own color, we supply the warning labels loose. The labels can be found in a wallet attached to the generator together with this manual.

2.8 Pre-running Check

Before start Generator set:

- ☺ Test the insulation resistance of windings. If stator winding insulation resistance value below 1Megaohm and other winding insulation resistance below 100,000 Megaohm, do not start the alternator no matter it's new or old alternator. Please refer to Chapter 4.1 to recovery the alternator.
- ☺ Check all connections are in the correct location and tight.
- ☺ Check the alternator air path is clear of obstructions.
- ☺ The direction of rotation of the alternator is designed to be clockwise as viewed from the drive end of the alternator so as to get phase sequence of U V W. If the direction is CCW, please change sequence of 2 and 3.
- ☺ Check that the voltage output is matching requirement.



Please stop alternator for any alternator reconnect terminals.

- ☺ The circuit-breaker must conforms to local legal request on protection of personnel in force of use. It must

be ensured that the circuit-breaker has been correctly installed on the alternator power output as close as possible to the alternator.

- ☺ Any protection devices in place have not been tripped.
- ☺ There is no short-circuit phase-phase or phase-neutral between the alternator output terminals and the generator set control cabinet.

3. Operation



The machine can only be started up and used if the installation is in accordance with the regulations and instructions defined in this manual.



During testing it may be necessary to remove covers to adjust controls exposing 'live' terminals or components. Only personnel qualified to perform electrical service should carry out testing and/or adjustments. Refit all access covers after adjustments are completed.

The machine is completely tested and set up at the factory with full load. When first use alternator, please ensure that the engine has been tested well under related regulation and procedure, the engine speed protection has been secured. When first used with no load, make sure that the drive speed is correct and stable (see the nameplate).

On application of the load, the machine should achieve its rated speed and voltage; however, in the event of abnormal operation, the machine setting can be altered (follow the adjustment procedure in section 3.5). If the machine still operates incorrectly, the cause of the malfunction must be located (see chapter 4.3.1 and 4.3.2).

3.1 Alternator Setting

The various adjustments during tests must be made by a qualified engineer. The screwdriver must comply with electric equipment (Sincox has equipped plastic screwdriver with alternator). Ensure that the drive speed specified on the nameplate is reached before commencing adjustment. The generator AVR controls will have been adjusted during the generating set manufacturer's tests and should normally not require further adjustment. Should adjustment on site be necessary and for paralleling adjustments see section on Automatic Voltage Regulators. You can reach AVR by opening terminal box AVR cover. Please recover it after finish all adjustment work.

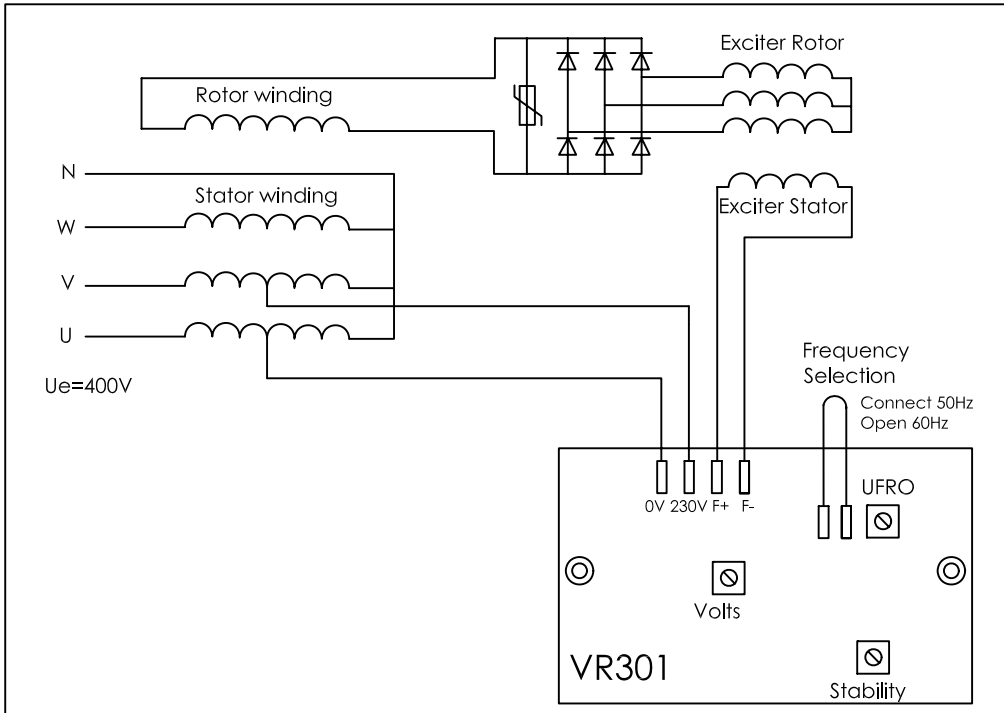
3.2 AVR VR301Setting

3.2.1 VR301Parameter

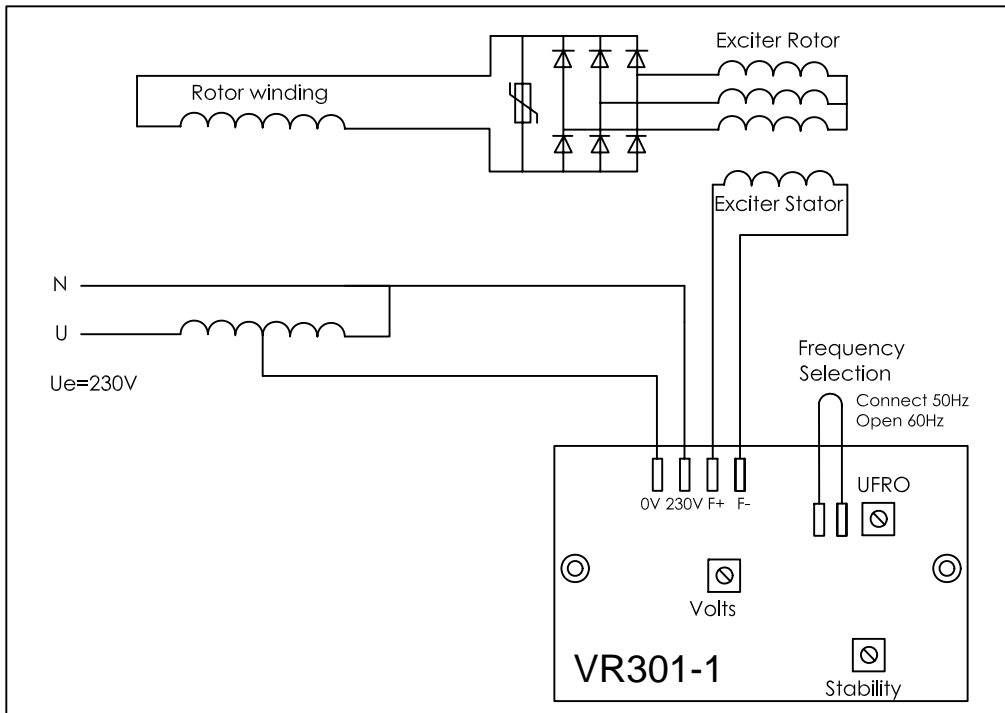
Main Parameter	Content	Value	Remark
Sensing Input	Voltage	170-260VAC	
	Frequency	50/60Hz,	Jumper Selectable
Power Input	Voltage	80-260V	Single Phase, 2 wires
Output	Voltage	Max. 90VDC	At 220VACinout
	Current	4A	Intermittent: 8A for10Sec
	Resistance	Min 9 ohm	
Voltage Regulation		±1%	With enging governing<4%
Voltage build-up		Residual Voltage at AVR terminal >5VAC	
Frequency	60Hz	57Hz	Factory Set
Protection	50Hz	47Hz	Factory Set
Soft start ramp time		2 sec.	

3.2.2 Diagram

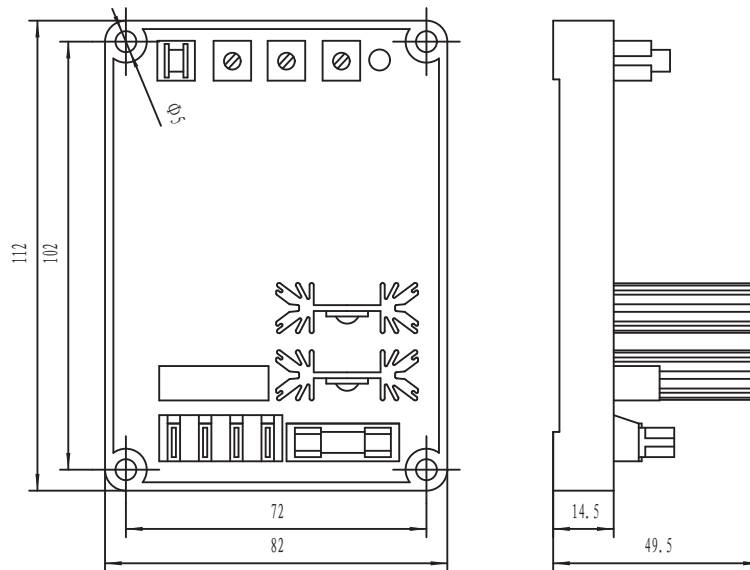
VR301 AVR DIAGRAM(FOR 3 PHASE)



VR301-1 AVR DIAGRAM(FOR DEDICATED SINGLE PHASE)



3.2.3.1 Dimension



3.2.3.2 Setting

- Ensure all wires of regulator are correctly connected and the proper fuse(5A/250V) is fitted.
- Switch voltage potentiometer full CCW (for lowest voltage level)
- Switch stability potentiometer full CW (for highest stability level).
- Connect a 110VDC meter across E- and E+ terminals.
- Connect a 500VAC meter to alternator voltage output ends.
- When start alternator at no load and rated speed, the alternator voltage output should build up to a minimum level. If the voltage can not be built up, it may be caused by low residual voltage of alternator. Please refer to chapter 4.3.2.
- Slowly adjust voltage potentiometer clockwise until alternator voltage reach the proper value.
- If the voltage output is unstable, please carefully switch stability trimmer anticlockwise until stable voltage reached.

3.2.4 Frequency

3.2.4.1 Frequency Change

Sincox alternator can be used either 50Hz or 60Hz application. When 50/60Hz jumperconnected (factory set), it's for 50Hz operation, or the jumper unconnected for 60Hz.

3.2.4.2 Frequency Adjustment

Through UFRO (Under Frequency Roll-Off) switch. Frequency adjustment and low frequency lock set has been fix during factory test, and the switch has been sealed. The low frequency protection set by following value:

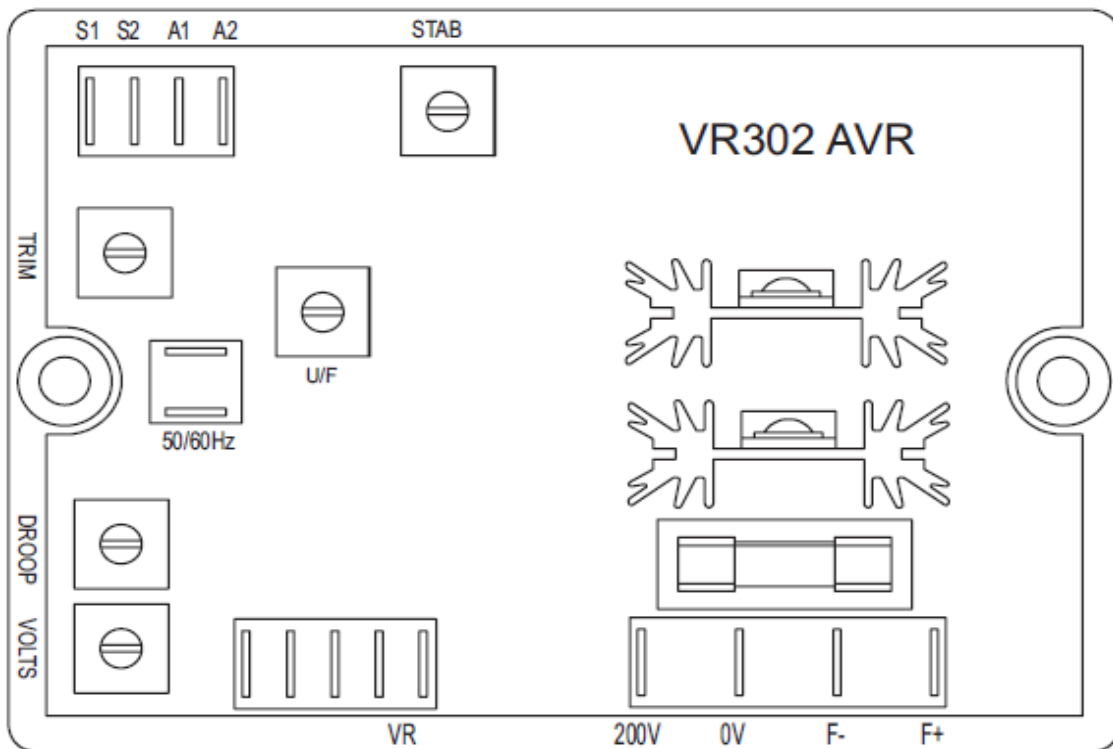
47Hz – 50Hz

57Hz – 60Hz

3.3 AVR VR302 Setting

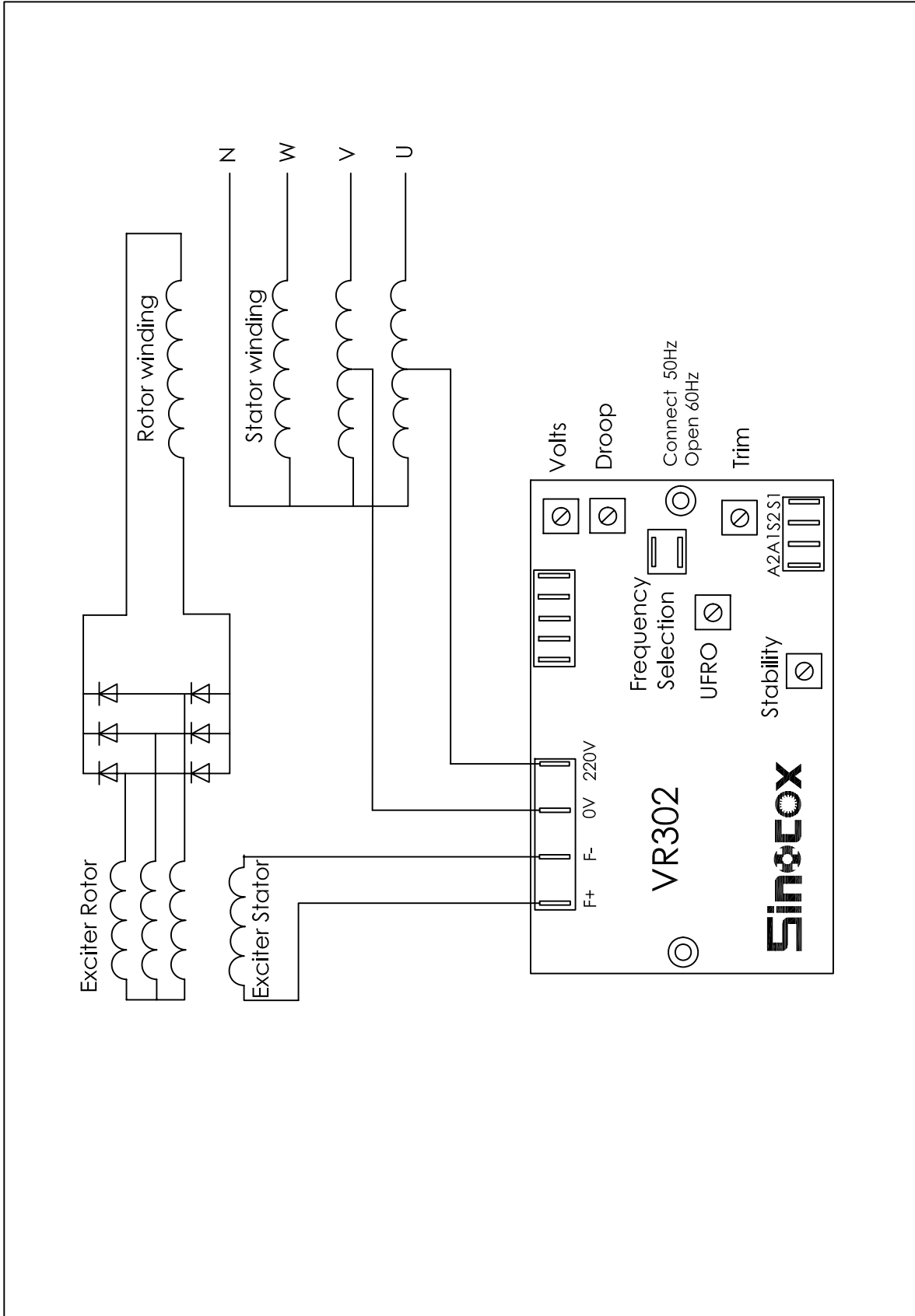
3.3.1 VR302 Parameter

Main Parameter	Content	Value	Remark
Sensing Input	Voltage	170-260VAC	
	Frequency	50/60Hz	Jumper Selectable
Power Input	Voltage	80-260V	Single Phase, 2 wires
Output	Voltage	Max.90VDC	At 220VACinout
	Current	4A	Intermittent: 8A for10Sec
	Resistance	Min 9 ohm	
Voltage Regulation		$\pm 1\%$	With enging governing <4%
Voltage build-up		Residual Voltage at AVR teminal >5VAC	
Frequency	60Hz	57Hz	
Protection	50Hz	47Hz	Fanctory Set
Soft start ramp time		2sec.	



- S1, S2: Current sensing for parallel operation, input S1,S2 intended for 1 C.T. \cong secondary 1A. Quadrature droop adjustment via potentiometer DROOP.
- A1,A2: Voltage sensing for parallel operation, input A1,A2 intended for \pm Sensitivity adjustment via potentiometer TRIM.
- Frequency: 50Hz with jumper, 60Hz without jumper.
- Voltage setting via potentiometer VOLTS
- Stability setting via potentiometer STAB
- VR: Potentiometer for remote voltage adjustment, $1K \Omega / 1W$. Remove the jumper.

3.3.2 VR302 Diagram



4. Maintenance



Servicing or troubleshooting must be carried out strictly in accordance with instructions so as to avoid the risk of accidents and to maintain the machine in its original state.



All such operations performed on the alternator should be undertaken by personnel trained in the commissioning, servicing and maintenance of electrical and mechanical components.

Before any intervention on the machine, ensure that it cannot be started by a manual or automatic system and that you have understood the operating principles of the system.

Warning: during operation or after operation, the temperature of alternator will be raised which may cause injury, such as scald.

4.1 Winding:

When confirm alternator winding insulation resistance is too low, please dry winding by following methods.

- a) Cold Run: AVR terminals open circuit - for a period of say 10 minutes will sufficiently dry the surface of the windings and raise the IR to greater than 1.0 Mega ohm, and so allow the unit to be put into service.
- b) Blown air drying: Remove the covers from all apertures to allow the escape of the water-laden air. During drying, air must be able to flow freely through the alternator in order to carry off the moisture. Direct hot air can be from electrical fan heaters into the alternator air inlet apertures. Ensure the heat source is at least 350mm away from the windings to avoid over heating and damage to the insulation. Record IR per 15 min until rated value reached item 2.8 listed value. Stop heating and replace the covers.
- c) Short Circuit Method: running under short circuit mode (without AVR):
 - Short-circuit the three output terminals (power) using connections capable of supporting the rated current (try not To exceed 6 A/ mm²).
 - Insert a clamp ammeter to monitor the current passing through the short-circuit connections
 - Connect a 48 Volt battery in series with a rheostat of approximately 10 ohms (50 W) to the exciter field terminals, check the polarity carefully.
 - Open all alternator cover and apertures.
 - Run the alternator at its rated speed, and adjust the exciter field current using the rheostat to obtain the rated output current in the short-circuit connections.



The short circuit must not be applied with the AVR connected in circuit. Current in excess of the rated generator current will cause damage to the windings.

4.2 Bearing:

Sincox alternator use long life permanently greased C3 ball bearing. As the working condition and environment of bearing is different depending on end-user, We recommend that the user check the bearing condition, using monitoring equipment, to determine the state of the bearings.

The bearing life is approximate 25000 hours or 3 years, which must be under regular operation, and the ambient temperature is less than 50°C with the vibration limit to ISO 8528-9 or BS5000-3regulation. (The bearing life is also subject to the alternator under regular maintenance.)

4.3 TroubleShoot:

If the alternator can not work normally after commissioning, the problem of alternator must be found. Please check following:

The protective devices are fitted correctly; the connections comply with the diagrams in the manuals supplied with the machine; the speed of Generator set is correct.

Maintenance and troubleshooting is a very technical job, which must be conducted by trained and qualified personnel. When customers can not address the problem, please just record it carefully and contact Sincox service engineer timely.

4.3.1 Mechanical Fault

Fault		Action
Bearing	Excessive overheating of one or both bearings (temperature > 80 °C on the bearing retainers with or without abnormal noise)	<ul style="list-style-type: none"> - If the bearing has turned blue or if the grease has turned black, change the bearing. - Bearing not properly seated. - End shields misaligned (flanges not properly fitted)
Temperature abnormal	Excessive overheating of alternator frame (more than 40 °C above the ambient temperature)	<ul style="list-style-type: none"> - Air flow (intake-outlet) partially clogged or hot air is being recycled from the alternator or engine - Alternator operating at too high a voltage (> 105% of Un on load) - Alternator overloaded
Vibration	Excessive vibration	<ul style="list-style-type: none"> - Misalignment (coupling) - Defective mounting or play in genset. - Rotor balancing fault
	Excessive vibration and humming noise coming from the machine.	<ul style="list-style-type: none"> - 3 phase unbalance. - Stator short circuit.
Abnormal noise	Alternator damaged by a significant impact, followed by humming and vibration.	<ul style="list-style-type: none"> - System short-circuit - Mis-paralleling possible consequences - Broken or damaged coupling - Broken or bent shaft end - Shifting and short-circuit of main field - Fan fractured or coming loose on shaft - Irreparable damage to rotating diodes or AVR

4.3.2 Electrical Fault

Fault	Action	Result	Reason
No voltage at no load on start-up.	Connect between F- and F+ a new battery of 4 to 12 volts, respecting the AVR polarities, for 2 to 3 seconds	The alternator builds up and its voltage is still correct when the battery is removed.	-Lack of residual magnetism.
		The alternator builds up but its voltage does not reach the rated value when the battery is removed.	<ul style="list-style-type: none"> - Check the connection of the voltage reference to the AVR - Faulty diodes - Armature short-circuit
		The alternator builds up but its voltage disappears when the battery is removed	<ul style="list-style-type: none"> - Faulty AVR - Field windings disconnected (check winding) - Main field winding open circuit. Check the resistance

Voltage too low	Check the engine drive speed	Speed is correct	<ul style="list-style-type: none"> - Check the AVR connections (AVR may be faulty) - Field windings short-circuited - Rotating diodes burnt out - Main field winding short-circuited - Check the resistance
		Speed is too low	Increase the drive speed (Do not touch the AVR voltage pot. (VOLTS) before running at the correct speed.)
Voltage too high	Adjust AVR voltage potentiometer	ineffective	- AVR damaged.
Voltage oscillations	Adjust AVR stability potentiometer	If no effect: try normal/rapid recovery modes (STAB)	<ul style="list-style-type: none"> - Check the speed: possibility of cyclic irregularity - Loose connections - Faulty AVR - Speed too low when on load
Voltage correct at no load and too low when on load	Run at no load and check the voltage between F+ and F- on the AVR	Voltage between F+ and F-: < 6V	- Check speed
		Voltage between F+ and F-: > 10V	<ul style="list-style-type: none"> - Faulty rotating diodes - Short-circuit in the main field. Check the resistance - Faulty exciter armature
Voltage disappears during running	Check the AVR, the surge suppressor, the rotating diodes, and replace any defective components	The voltage does not return to the rated value	<ul style="list-style-type: none"> - Exciter winding open circuit - Faulty exciter armature - Faulty AVR - Main field open circuit or short-circuited

4.4 Dismantling and replace the parts:

In order to dismantle alternator, we strongly recommend that customers use following tools:

- 1 ratchet spanner + extension
- 1 torque wrench
- 1 set of flat spanners: 8 mm, 10 mm, 18 mm
- 1 socket set: 8 mm, 10 mm, 13 mm,
- 1 T20 and T30 TORX bit
- 1 puller (eg. Facom: U32/350).

When re-assemble alternator, following torque value must be followed.

Description	Bolt Ø	Torque N.m
Exciter bolt	M 6	10
Diode bridge bolt	M5	4
Bracket/Housing Bolt	M8	20
Earth bolt	M6	5
Balance bolt	M5	4
Disc/Shaft bolt	M10	66
Grille bolt	M5	4
Cover bolt	M5	3.6

4.4.1 Bearing replace:

In order to replace bearing safely, please prepare following tools in advance:

- Proper cleanser;
- 2 or 3 feet puller (manual or hydraulic);
- Protective glove and lint-free cleaning cloth;
- Induction Heater;

As the dust is the main reason of bearing pollution, please keep the environment clean when dismantle and replace.

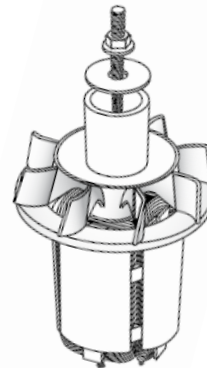
- 1) Bearing is positioning on the shaft, remove end cover and pull the bearing using puller;
- 2) Use lint-free cloth clean new bearing;
- 3) Heat the new bearing by induction or in a drying oven at 80 °C (do not use an oil-bath).
- 4) Push the bearing back to shaft position until the bearing touch the shaft shoulder completely;
- 5) Place a new wavy washer and o-ring;
- 6) Refit the NDE bracket;

4.4.2 Main rotor replace:

Before replace main rotor, please remove all covers, AVR and exciter wire connection.

Dismantle:

- 1) Unscrew the drive disc connection bolt;
- 2) Connect shaft drive end by special tooling, and hang on sling;
- 3) Unscrew the Non-drive end bolts;
- 4) Rising the hoist, and pull out the rotor steadily;



When refit the rotor, please follow above reserve order.

Please do not crack the fan when replace the rotor.

After test complete, please refit all covers and connect AVR

4.5 Spare Parts

We recommend following spare part base on service and maintenance need:

1. AVR VR301 or VR302 ;
2. Diode Set;
3. Non-drive bearing;

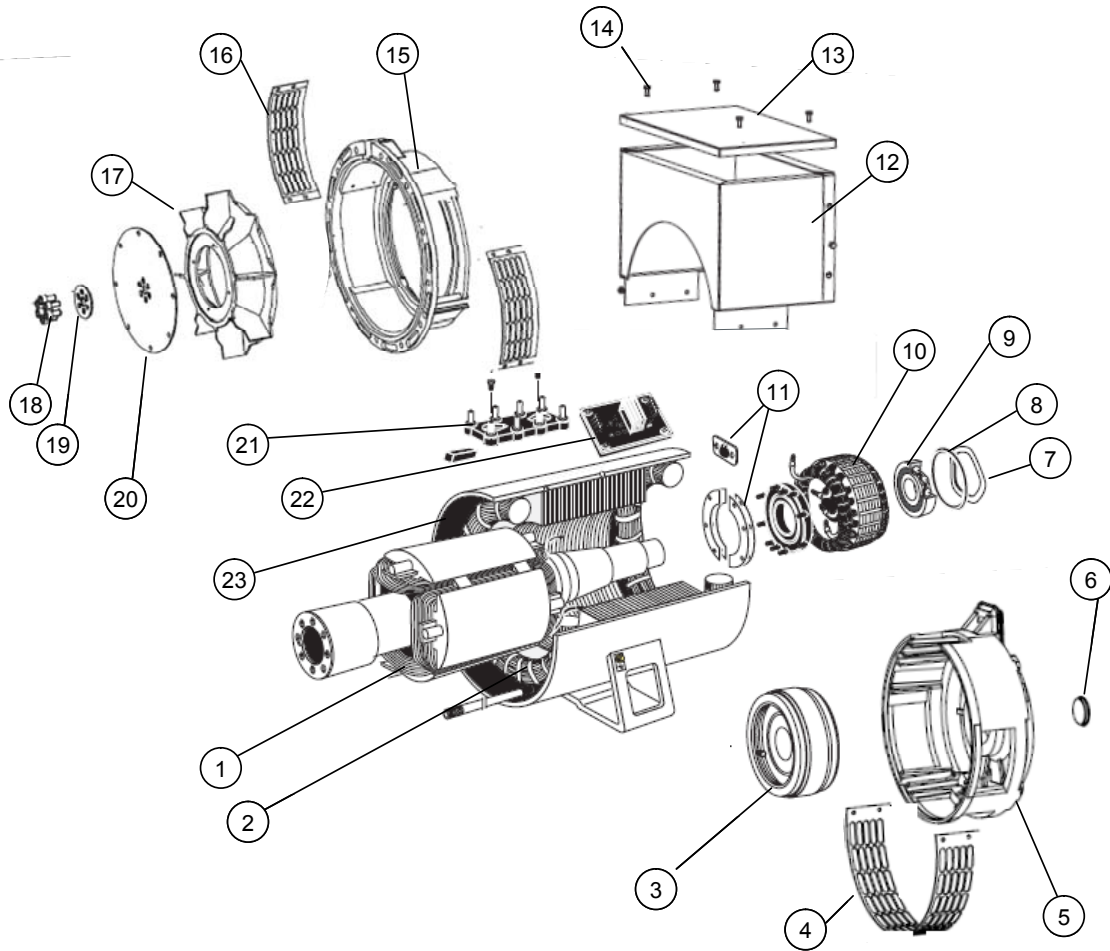
When you need order other spare parts, please submit us the alternator model you ordered and serial No. with related parts name and No.(please refer to App. 1 SM single bearing alternator drawing). Please send your parts order to :

Sinocox Electro-Mechanical (Fuzhou) Co., Ltd.

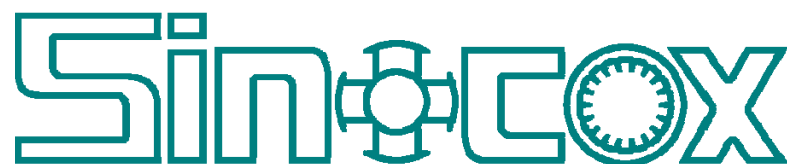
Fax: 0086-591-62080668

Email: service@sinocox.com

APP. 1: SM Single bearing Alternator Exploded View and Parts List



Part No.	Name	Part No.	Name
1	Rotor assembly	13	Top plate of T-box
2	Stator assemble	14	Fixing screw of T-box
3	Excite stator	15	D.E Adapter
4	N.D.E screen	16	D.E Screen
5	End bracket	17	Fan
6	End bracket cover	18	Fixing bolts
7	Wavy washer	19	Drive disc washer
8	Spring washer	20	Drive disc
9	Non-drive bearing	21	Terminal block
10	Exciter rotor	22	AVR VR301
11	Diode set	23	Housing
12	Side plate of T-box		



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