

**R221**

**A.V.R.**

Installation and maintenance

**LEROY-SOMER™**

***Nidec***  
All for dreams

# R221

## A.V.R.

**This manual concerns the alternator A.V.R. which you have just purchased. We wish to draw your attention to the contents of this maintenance manual.**

### SAFETY MEASURES

Before using your machine for the first time, it is important to read the whole of this installation and maintenance manual.

All necessary operations and interventions on this machine must be performed by a qualified technician.

Our technical support service will be pleased to provide any additional information you may require.

The various operations described in this manual are accompanied by recommendations or symbols to alert the user to potential risks of accidents. It is vital that you understand and take notice of the following warning symbols.

#### WARNING

**Warning symbol for an operation capable of damaging or destroying the machine or surrounding equipment.**



**Warning symbol for general danger to personnel.**



**Warning symbol for electrical danger to personnel.**



**All servicing or repair operations performed on the AVR should be undertaken by personnel trained in the commissioning, servicing and maintenance of electrical and mechanical components.**



**When the generator is driven at a frequency less than 28 Hz for more than 30 seconds with an analogic regulator, the AC power must be disconnected.**

#### WARNING

**This A.V.R. can be incorporated in a machine marked C.E. This manual is be given to the end user.**

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# R221 A.V.R.

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### Disposal and recycling instructions

## WARNING

The AVR R221 is dedicated for the alternators LSA40 and LSA423 single phase (50Hz/60Hz). It is particularly recommended for applications in which the alternator's voltage difference between no-load operation and load operation is out of ISO8528-3 class G2.

The R221 is an IP00 product. It must be installed inside a unit so that this unit's cover can provide IP20 minimum total protection (it must only be installed on our alternators in the appropriate location so that when viewed externally, it has a higher degree of protection than IP20).

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### 1 - SUPPLY

#### 1.1 - SHUNT excitation system

The alternator with Shunt excitation is self-excited with an R221 voltage regulator. The regulator monitors the exciter excitation current as a function of the alternator output voltage. Very simple in design, the alternator with shunt excitation has no sustaining short-circuit capacity.

### 2 - R221 A.V.R.

#### 2.1 - Characteristics

- Storage : -55°C ; +85°C
- Operation : -40°C ; +65°C
- Voltage regulation:  $\pm 0.5\%$ .
- Voltage supply/sensing range 85 to 139 V (50/60 Hz)
- Rapid response time (500 ms) for a transient voltage variation amplitude of  $\pm 20\%$
- Voltage setting **P1**
- Stability setting **P2**.

- Power supply protected by 8 A fuse, slow-blow action (tolerates 10 A for 10 s)  
The fuse is impregnated in the resin, therefore it can not be replaced.
- Frequency: 50 Hz with **ST3** jumper - 60 Hz without **ST3** jumper.
- The size of the screwdriver tip used to adjust the potentiometer is 2.5 mm.

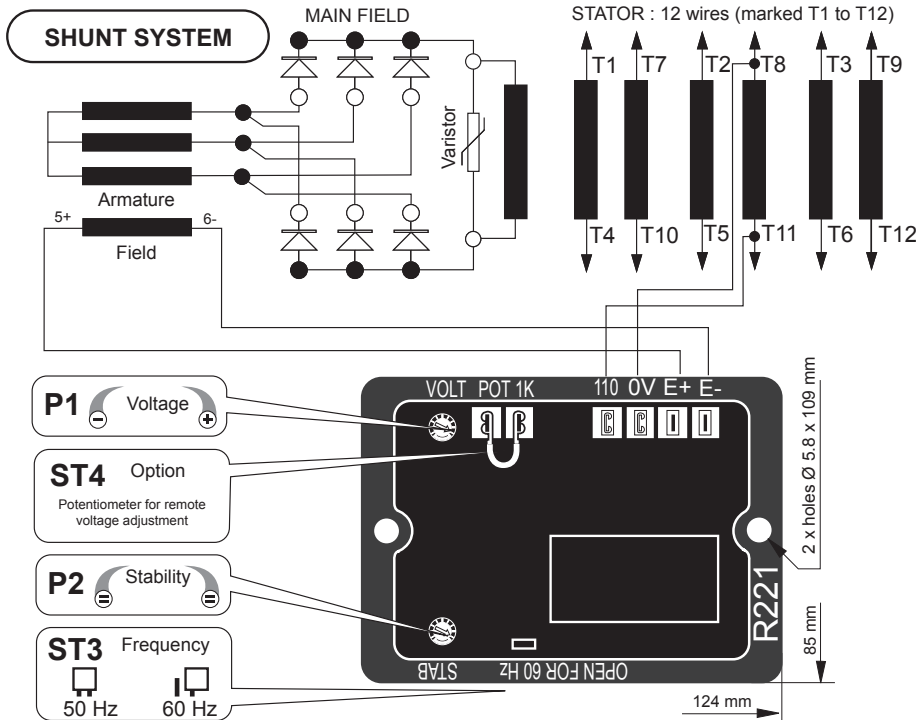
#### 2.2 - R221 AVR option

Potentiometer for remote voltage adjustment, 1000  $\Omega$  / 0.5 W min: adjustment range  $\pm 5\%$ .

- Remove the **ST4** jumper.



**For wiring up the external potentiometer; the "earth" wires must be isolated as well as the potentiometer terminals (wires at the same voltage as the power).**



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### 3 - INSTALLATION - COMMISSIONING

#### 3.1 - Electrical checks on the AVR

- Check that all connections have been made properly as shown in the attached wiring diagram.
- Check that the ST3 frequency selection jumper is on the correct frequency setting.
- Check whether the ST4 jumper or the remote adjustment potentiometer have been connected.

#### 3.2 - Settings



The machine is tested and set at the factory. When first used with no load, make sure that the drive speed is correct and stable (see the nameplate). After operational testing, replace all access panels or covers.

The only possible adjustments to the machine should be made on the AVR.

#### 3.2.1 - R 221 setting (shunt system)

Initial potentiometer settings

- **P1** potentiometer (AVR voltage adjustment): fully anti-clockwise.
- Remote voltage adjustment potentiometer: centre position.

Run the alternator at its rated speed. If the voltage does not increase, the magnetic circuit should be remagnetized (see section 3.3).

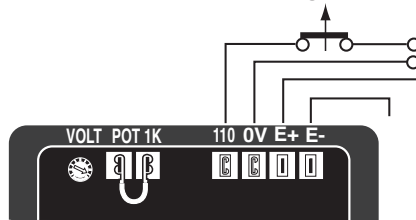
- Turn the AVR voltage adjustment potentiometer **P1** slowly until the output voltage rated value is obtained.
- Adjust the stability setting using **P2**. Clockwise: increase the rapidity. Anti-clockwise: decrease the rapidity.

#### 3.2.2 - Special type of use

**WARNING**

Excitation circuit E+, E- must not be left open when the machine is running : AVR damage will occur.

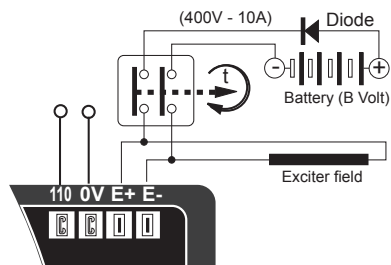
#### 3.2.2.1 - R221 field weakening (SHUNT)



The exciter is switched off by disconnecting the AVR power supply (1 wire - 0 or 110V). Contact rating : 16A - 250V alt.

The power supply contactor must only be closed when the alternator is not being driven

#### 3.2.2.2 - R221 field forcing



**Battery must be isolated from the earth.**



**Exciter field may be at line potential.**

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### 3.3 - Electrical faults

Fault	Action	Effect	Check/Cause
No voltage at no load on start-up	Connect a new battery of 4 to 12 volts to terminals E- and E+, respecting the polarity, 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.	- 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	- Faulty AVR - Field windings disconnected - Main field winding open circuit - check the resistance
Voltage too low	Check the drive speed	Correct speed	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 too low	Increase the drive speed (Do not touch the AVR voltage pot. (P2) before running at the correct speed)
Voltage too high	Adjust AVR voltage potentiometer	Adjustment ineffective	Faulty AVR
Voltage oscillations	Adjust AVR stability potentiometer		- Check the speed : possibility of cyclic irregularity - Loose connections - Faulty AVR - Speed too low when on load (or U/F bend set too high)
Voltage correct at no load and too low when on load (*)	Run at no load and check the voltage between E+ and E- on the AVR		- Check the speed (or U/F bend set too high)
			- Faulty rotating diodes - Short-circuit in the main field. Check the resistance - Faulty exciter armature.
<b>(*) Caution :</b> For single-phase operation, check that the sensing wires coming from the AVR are correctly connected to the operating terminals			
Voltage disappears during operation	Check the AVR, the surge suppressor, the rotating diodes, and replace any defective components	The voltage does not return to the rated value.	- Exciter winding open circuit - Faulty exciter armature - Faulty AVR - Main field open circuit or short-circuited



**Warning : after operational testing, replace all access panels or covers.**

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## A.V.R.

### 4 - SPARE PARTS

#### 4.1 - Designation

Description	Type	Code
A.V.R.	R221	AEM 110 RE 042

#### 4.2 - Technical support service

Our technical support service will be pleased to provide any additional information you may require.

For all spare parts orders or technical support requests, send your request to [service.epg@leroy-somer.com](mailto:service.epg@leroy-somer.com) or your closest contact, whom you will find at [www.lrsom.co/support](http://www.lrsom.co/support) indicating the type and the code number of the A.V.R.

To ensure correct operation and the safety of our machines, we recommend the use of original manufacturer spare parts.

In the event of failure to comply with this advice, the manufacturer cannot be held responsible for any damage.

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### Disposal and recycling instructions

We are committed to limit the environmental impact of our activity. We continuously survey our production processes, material sourcing and products design to improve recyclability and diminish our footprint.

These instructions are for information purposes only. It is the user responsibility to comply with local legislation regarding product disposal and recycling.

The oil and grease from the lubrication system should be considered as a hazardous waste and has to be handled according to local legislation.

### Recyclable materials

Our alternators are mainly built out of iron, steel and copper materials, which can be reclaimed for recycling purposes.

These materials can be reclaimed through a combination of manual dismantling, mechanical separation and melting processes. Our technical support department can provide detailed directions on products dismantling upon request.

### Waste & hazardous materials

The following components and materials need a special treatment and need to be separated from the alternator before the recycling process:

- electronic materials found in the terminal box, including the Automatic Voltage Regulator (198), Current Transformers (176), interference suppression module (199) and other semi-conductors.
- diode Bridge (343) and Surge suppressor (347), found on the alternator rotor.
- major plastic components, such as the terminal box structure on some products. These components are usually marked with plastic type information.

All materials listed above need special treatment to separate waste from reclaimable material and should be handed to specialized disposal companies.



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# Service & Support

Our worldwide service network of over 80 facilities is at your service.

This local presence is our guarantee for fast and efficient repair, support and maintenance services.

Trust your alternator maintenance and support to electric power generation experts. Our field personnel are 100% qualified and fully trained to operate in all environments and on all machine types.

We know alternators operation inside out, providing the best value service to optimize your cost of ownership.

Where we can help:



Contact us:

**Americas:** +1 (507) 625 4011

**Europe & Rest of the world:** +33 238 609 908

**Asia Pacific:** +65 6250 8488

**China:** +86 591 88373036

**India:** +91 806 726 4867

**Middle East:** +971 4 811 8483



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