THE POWER OF SYNERGY

6GA2490

Voltage regulator for generators

Instruction Manual V1.2

Product version V1.2.0.0

EMRI ELECTRONICS POWER IN CONTROL

MANAGEMENTSYSTEEM CERTIFICATIE DNV·GL ISO 9001 = VCA*

WARNINGS AND COMMISSIONING INFORMATION

HAZARDOUS VOLTAGES.
DO NOT OPERATE WHEN NOT FAMILIAR WITH GENERATORS.

- ***Check the isolation of the generator windings before installation.***
  Poor isolation will cause damage to the AVR and dangerous situations for persons.
- The system should not be installed, operated, serviced or modified except by qualified personnel who understand the danger of electric shock hazards and have read and understood the user instructions.
- Never work on a LIVE generator. Unless there is another person present who can switch off the power supply or stop the engine.
- Dangerous voltages are present at the voltage regulator board. Accidental contact with live conductors could result in serious electrical shock or electrocution.
- Disconnect the power source before making repairs, connecting test instruments, or removing or making connections to the voltage regulator or generator.
- Defects in the generator or AVR may cause consequential loss. Precautions must be taken to prevent this from occurring.
- The unit should be installed with respect to the environmental specifications as well as the rules mentioned in the General installation information.
- For safety reasons the voltage level potentiometers are best turned completely counter clockwise in order to start at the lowest possible voltage.

REVISION HISTORY

Version			Change
Product	Hardware	Manual	
V1.0	1.0	1.0	*First release*
V1.1.0.0	1.0	1.1	New manual layout
V1.2.0.0	1.1	1.2	Minor hardware improvement.

The table provides a historical summary of the changes made to the AVR.
Revisions are listed in chronological order.

The manual does not cover all technical details of the product. Specifications may be modified by the manufacturer without notice. For further information, the manufacturer should be contacted.

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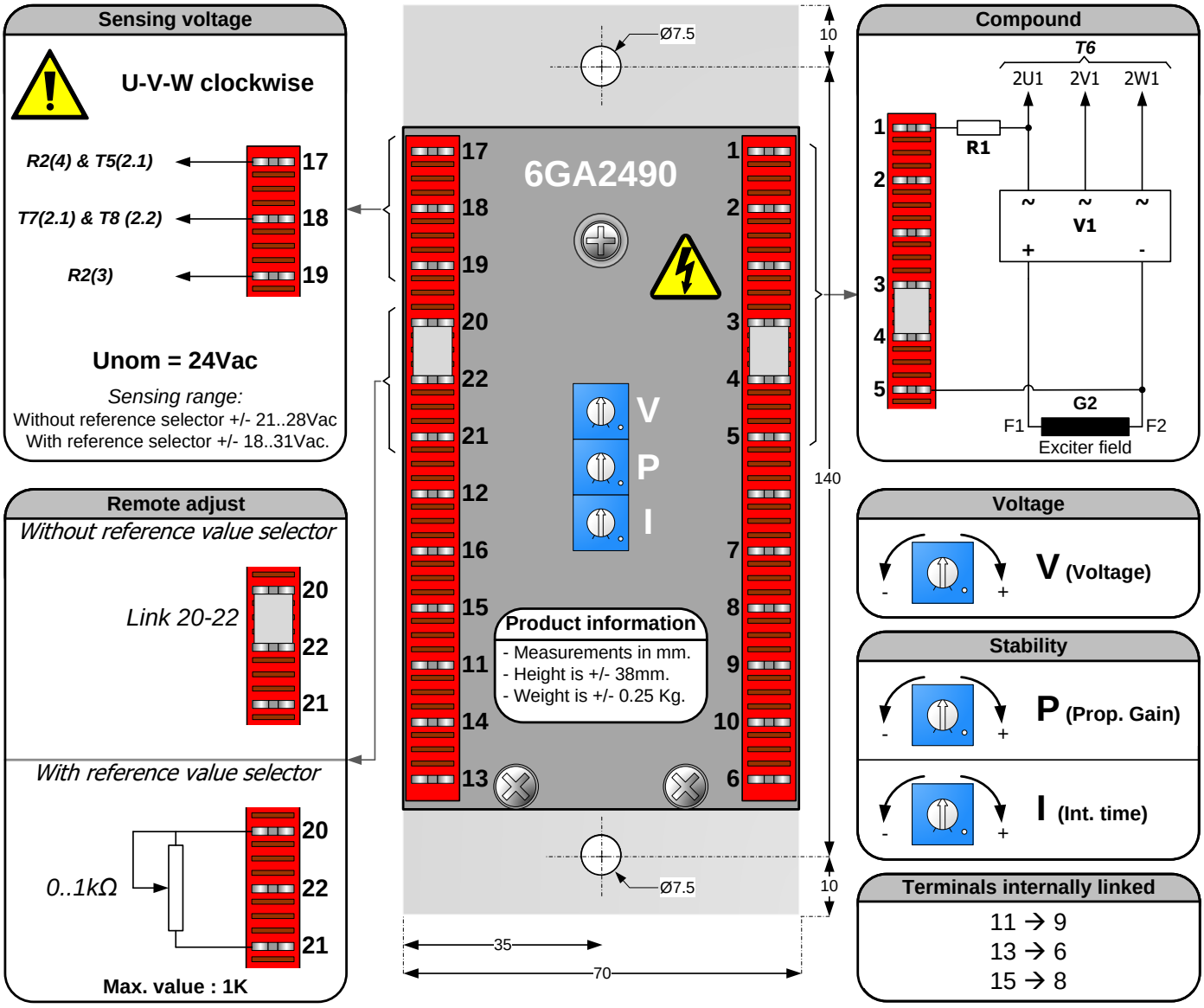
GENERAL DESCRIPTION

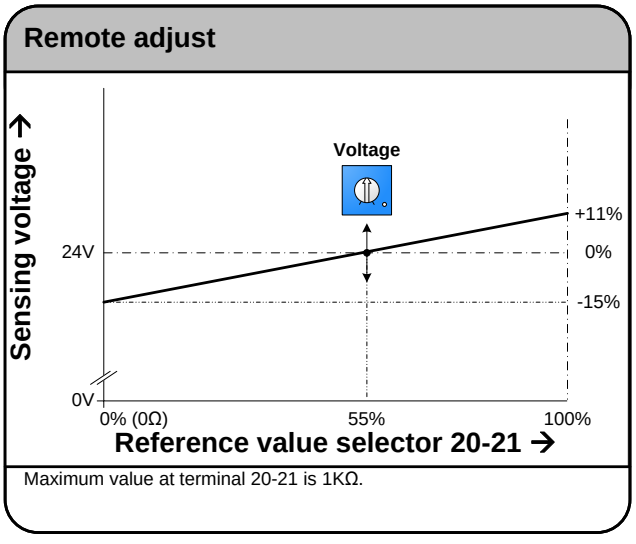
The EMRI 6GA2490 is an AVR which is an electrical and mechanical improvement of the old Siemens 6GA2490 & Spresy 15 AVR system used by Siemens, Uljanic and Hyundai.

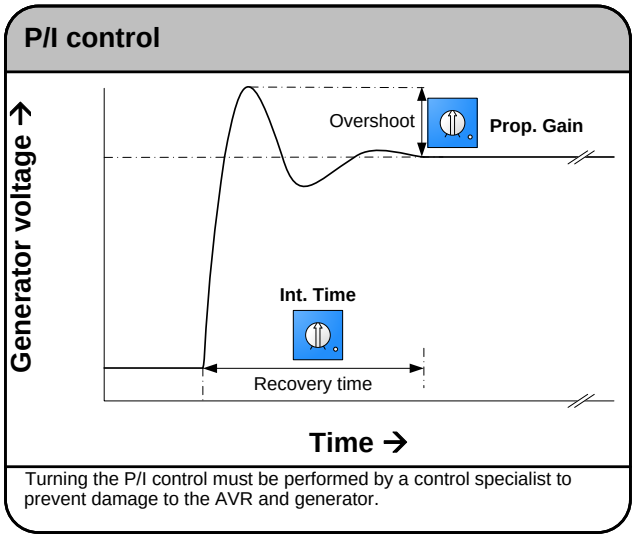
The product is more rugged and compact design to improve mechanical properties.
The unit is completely encapsulated for harsh environments. The moulding compound protects against vibrations and is heat conductive to improve temperature stability. The terminals are strong solid encapsulated to make it mechanical improvement compared to the genuine part.

Installation, maintenance and adjustment don’t require special application software.

QUICK REFERENCE

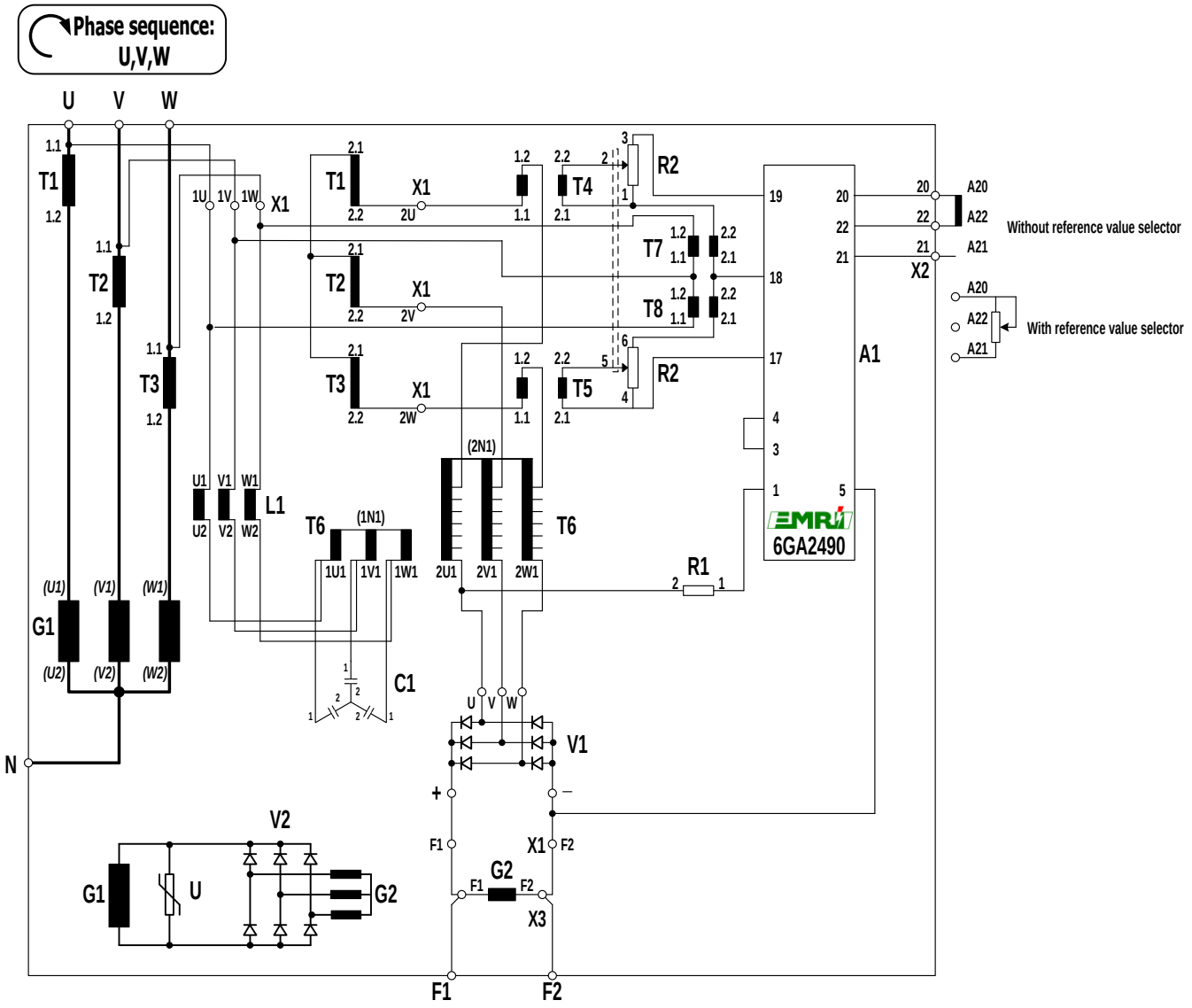






WIRING DIAGRAM

Wiring diagram with 6GA2490



A1	6GA2490 voltage regulator	**T1, T2, T3**	Single-phase current transformer
C1	Capacitor	**T4, T5**	Current transformer
G1	Main machine	**T6**	Rectifier transformer
G2	Exciter	**T7, T8**	Measuring transformer
L1	Reactor	**V1**	Steady state rectifier
R1	Series resistor	**V2**	Rotating rectifier
R2	Tandem potentiometer	**U**	Varistor

TIPS AND SUGGESTIONS

Explanation of operation of the 6GA2490 generator / excitaton system

Generator : No load operation

The excitation power / supply for the exciter field comes from the excitation transformer T6.
In no-load the value is determined by the settings of L1 (Airgap) and tapping's of T6.
This is during all conditions, loaded and unloaded generator. The excitation should be adjusted in such a way that it is always slightly too much. In the no load situation, the avr itself can only reduce the voltage. In other words: The excitation supply voltage from T6 is too much.

When you should disconnect eg. The internal wiring no. 1 or 5 from the AVR. The avr function is disabled, and you can see how much excitation power (and as a result of that) the generator voltage will raise. Reconnecting wire 1 or 5 enables the avr function again.

Generator : Load operation

When you load the generator, the excitation must increase. This additional excitation power must be supplied by the (current) transformers (T1, T2 and T3 and its connections to T6).
The current transformer should also always bring so much power in return for the current which is going through, that the total excitation power output of T6 is always a bit too much. The avr can only reduce the amount of excitation power which is too much through the internal leads 1 and 5.

If you run your generator with a disconnected lead 1 and 5 (internal wiring) and you still have a decreasing voltage at load. You should check the current transformer / adjust the airgap / check the symmetry of the ac voltage at 2U1, 2V1 and 2W1.

It is also possible that your generator needs too much excitation anyhow. Check this according the tag plate, or try to excite the generator manually with a controllable dc power source if you have.
It is possible that the exciter stator (field), the exciter rotor windings, the diodes, the overvoltage suppressor (if present at the diodes inside the generator) or the main rotor winding is defect.

T7 and T8 are the isolation and stepdown transformers for the sensing of the AVR
T4 and T5 are current transformers which provide the reactive current sharing system in combination with the tandem potentiometer R2.

Capacitors C1 are for the building up of the excitation.

Remember : The AVR can only reduce the voltage.

GENERAL INSTALLATION INFORMATION

Absolute Maximum Ratings

- The Absolute Maximum Ratings are those limits for the device that, if exceeded, will likely damage the device. Exceeding the absolute maximum ratings voids any warranty and/or guarantee.

Mounting

Mounting of the product should be done in such a way that:

- the absolute maximum ambient temperature rating of the product will never be exceeded.
- maximum cooling (direction of cooling ribs and direction of airflow) is achieved.
- Mounting no humid air can flow through the product or condensation occurs.
- dust or other materials or residue will not remain in or on the product.
- the maximum vibration is not exceeded.
- personal contact with persons is impossible.

Wiring

- Diameter size of the wiring should be enough to carry the expected current. Wire insulation should be enough to withstand the expected operating voltages and temperatures.
- To improve EMC emission and immunity, care should be taken for the lay out of the wiring. This in respect to all wiring in the installation.
- Keep current carrying wires as short as possible.
- Keep wires carrying a total sum of zero Ampere close to each other, or in one single cable, E.g. U, V, W, or F1(+) and F2(-), or Phase and neutral, or S and T.
- Avoid current carrying conductors next to sensing or control wiring. Especially current controlled by SCR's or PWM controlled transistors.
- If sensitive sensing signal cables need to be laid across distance along other cabling, shielded cable is preferred. Keep the shield as long as possible and the wiring outside the shield as short as possible. Do not solder or shrink the shield to a regular wire. Connect the original shield to ground at one side with an as large as possible contact surface.

Additional installation information

- When the product is supplied by means of a transformer, it should never be an auto-transformer. Auto-transformers react as voltage sweep up coil and may cause high voltage peaks.
- Standard fit capacitors or over-voltage suppressers across F1(+) and F2(-), or exciter field terminals inside the generator should be removed.
- When the product is supplied by means of a transformer, it should be able to carry at least the maximum expected current. Advisable is, to have a transformer which can carry twice the maximum expected current. Inductive loads make voltage sacks and peeks into the secondary voltage of a transformer, from which the device may malfunction.
- It is not recommended to apply switches in dc outputs. It is preferred to use switches in the ac supply inputs of devices. In case it is unavoidable to have switches in the dc output of a device, action must be taken to avoid over voltage damage to the device due to contact arcing. Use a voltage suppressor across the output.
- It is not recommended to apply switches or fuses in the sensing lines. Defects can cause high voltage situations due to over-excitation.
- When using a step down transformer in medium or high voltage generators, the transformer should be three phase (if three phase sensing), and the transformer should be suitable for acting as a sensing transformer. If the transformer is unloaded, connect a resistor to avoid voltage waveform distortion.
- The phase relation from the generator to the AVR is important. Also when voltage transformers and/ or current transformers are installed.
- When using a step down or insulation transformer in the droop circuit, phase relation from the generator to the AVR is important.
- CT's wiring, connected to the AVR should never be grounded.
- Always disconnect electronic products, circuits and people before checking the insulation resistance (Megger check).
- Due to differences in generators impedance's, EMC behavior is not predictable. Therefore the commissioner / installer should be aware of proper and correct installation.
- Large, highly inductive, exciter stator windings can cause destructive high voltage peaks. Adding a resistor from 10 to 20 times the exciter stator field resistance reduces voltage spikes. If necessary filter can be fitted additionally. (e.g. snubber, RC-network)
- Upon problems during commissioning, faulty behavior or defects in the generator, consult the fault finding manual at our web site
- Some advises may be overdone or seem extraordinary, but since the electrical rules are the same everywhere, these advises are given.

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