THE POWER OF SYNERGY

R280-R290

Voltage regulator for AC generators

Instruction Manual V1.0.1

Product version V1.0.0.0

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 to minimum setpoint in order to start at the lowest possible voltage.
- Never change the rotary switch or dipswitch settings during operation.
- Never apply supply voltage when generator is not running, unless exciter field is disconnected.

REVISION HISTORY

Version				Change
Product	Hardware	Manual	Date	
V1.0.0.0	1.0	1.0.1	Sep-2025	*First release*

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.

TABLE OF CONTENTS

GENERAL DESCRIPTION

The EMRI R280-R290 is designed as a replacement for the EME R280-R290.
The EMRI R280-R290 can also be a replacement for the AVK : R260-R261 or R260-R274
The AVR are used in generators:

EME : DKB
EME : DR, DB
EME : SDR, SDB
AVK : DKB
AVK : DKB-TS

The R280-R290 can be used for parallel operation with other generators that also control voltage droop by means of Quadrature Droop Compensation (QDC).
Parallel operation is possible with a CT.

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

The AVR is protected from the environment by a PUR coating.

ABSOLUTE MAXIMUM RATING

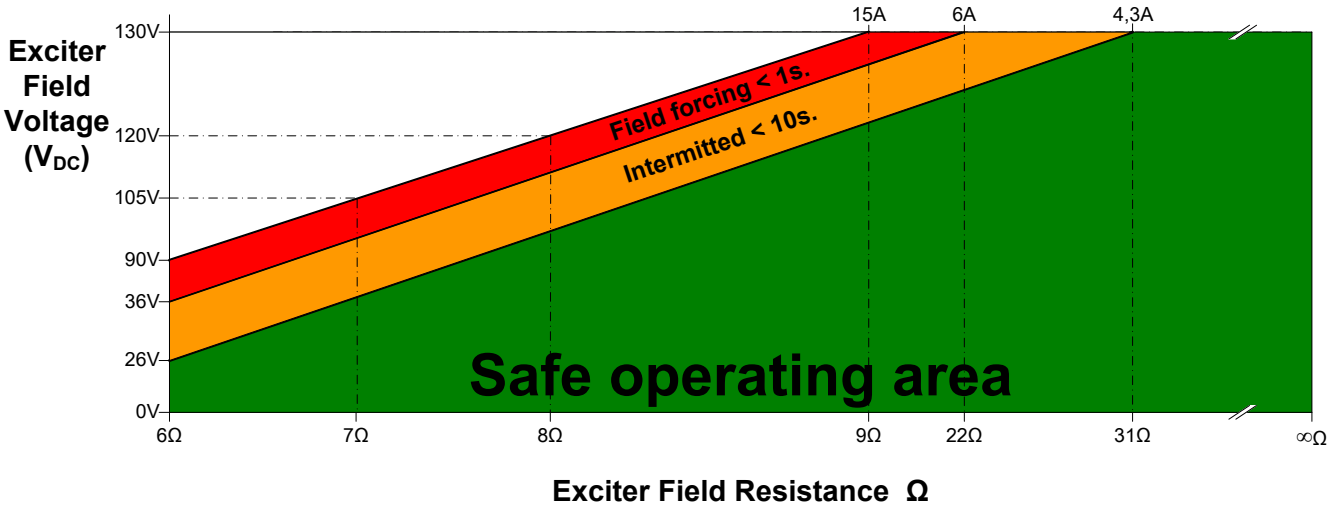
Symbol	Parameter	Condition	Min.	Max.	Unit
U', V', W'	Voltage sensing input **50-250V**	50Hz, continuous 50Hz, Intermitted < 30s. 60-400Hz, continuous 60-400Hz, Intermitted < 30s. Burden	- - - - -	230 240 250 260 5	V_{AC} V_{AC} V_{AC} V_{AC} VA
U, V, W	Voltage sensing input **250-500V**	50Hz, continuous 50Hz, Intermitted < 30s. 60-400Hz, continuous 60-400Hz, Intermitted < 30s. Burden	- - - - -	460 480 500 520 5	V_{AC} V_{AC} V_{AC} V_{AC} VA
J1(+), K1(-)	AVR field current	Continuous (1) Intermitted < 10s.	- -	4,3 6	A_{DC} A_{DC}
	Field resistance	@ $75V_{AC}$ supply (2) (3)	7	-	Ω
UH-VH UH'-VH'	Supply input	UH-VH, UH'-VH' (40 - 1500Hz.)	-	75 +/-20	V_{AC} %
1, 2	Droop	Isolated CT > 2VA, Intermitted < 30s.	-	0.5	A_{AC}
T_{AMB}	Operating temperature	95% RHD non condensing (1)	-40	+70	°C
T_{STG}	Storage temperature	95% RHD non condensing	-40	+70	°C
	Static control accuracy			1	%

(1) Always mount with heatsink fins aligned vertically and allow for sufficient airflow.
(2) See table below for safe operation area of the AVR.
(3) See formula for calculating minimum field resistance.

$$\text{Field resistance } (\Omega) \geq \frac{\text{Supply input x } \sqrt{2}\ (V_{DC})}{15}$$

Stresses above "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only, the functional operation of the device or any other conditions indicated in the "operation area" of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability and lifetime.

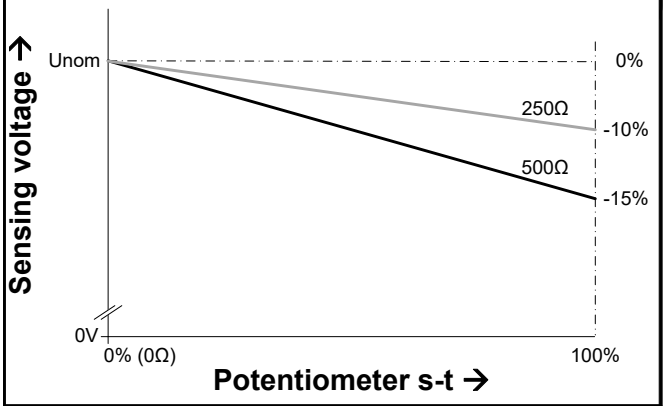
Operating Area



Exciter Field Voltage = Supply input x √2 (V_{DC})

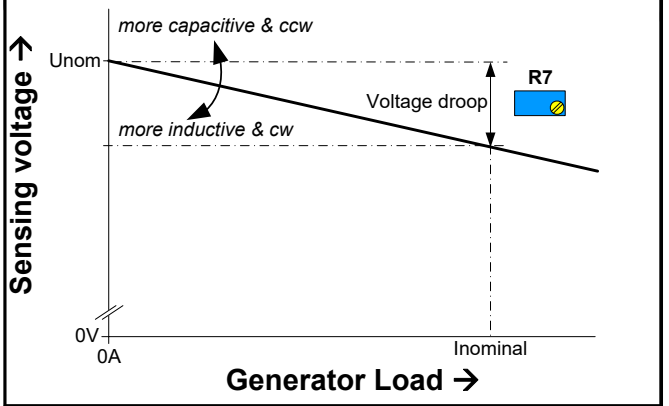
PRIMAIRY ADJUSTMENTS

Remote adjust



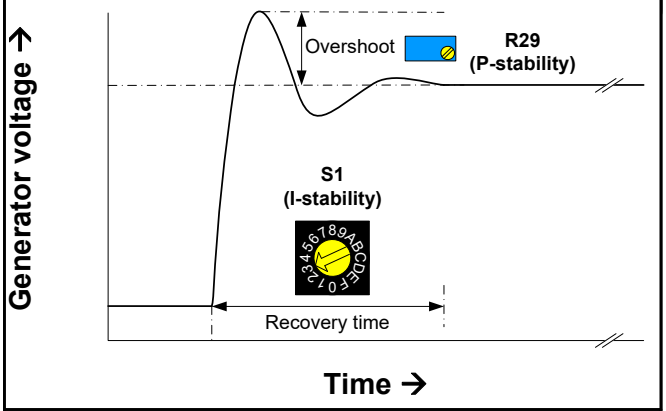
Maximum value at terminal s-t is 1KΩ.

Droop



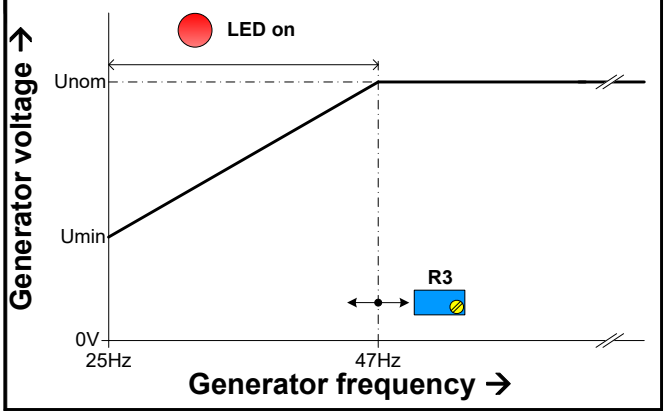
Droop range is 0-5%.

Stability



Turning the P/I control must be performed by a control specialist to prevent damage to the AVR and generator.

Underspeed protection



Too low Underspeed setpoint may cause damage to the generator or the AVR due to incorrect voltage / frequency ratio.
Umin = 57V @ sensing 50-250V / Umin = 112V @ sensing 250-500V

QUICK REFERENCE

Droop

R7

(Page 5)

Voltage

R4

Counter clockwise increases voltage

(Page 5)

Stability

R29 — P-action *(Propotional gain)*

S1 — I-action *(Integral time)*

"0" Not permitted !
"1" Fastest action
"F" Slowest action

(Page 5)

Underspeed setpoint

R3 — S2 — **on** — *Range 15-95Hz* — **Underspeed** (Page 5)

R3 — S2 — **off** — *Range 140-400Hz* — **Underspeed** (Page 5)

Current sensing

Original EME CT
or
xxxA: 0,25A

V phase 1 2

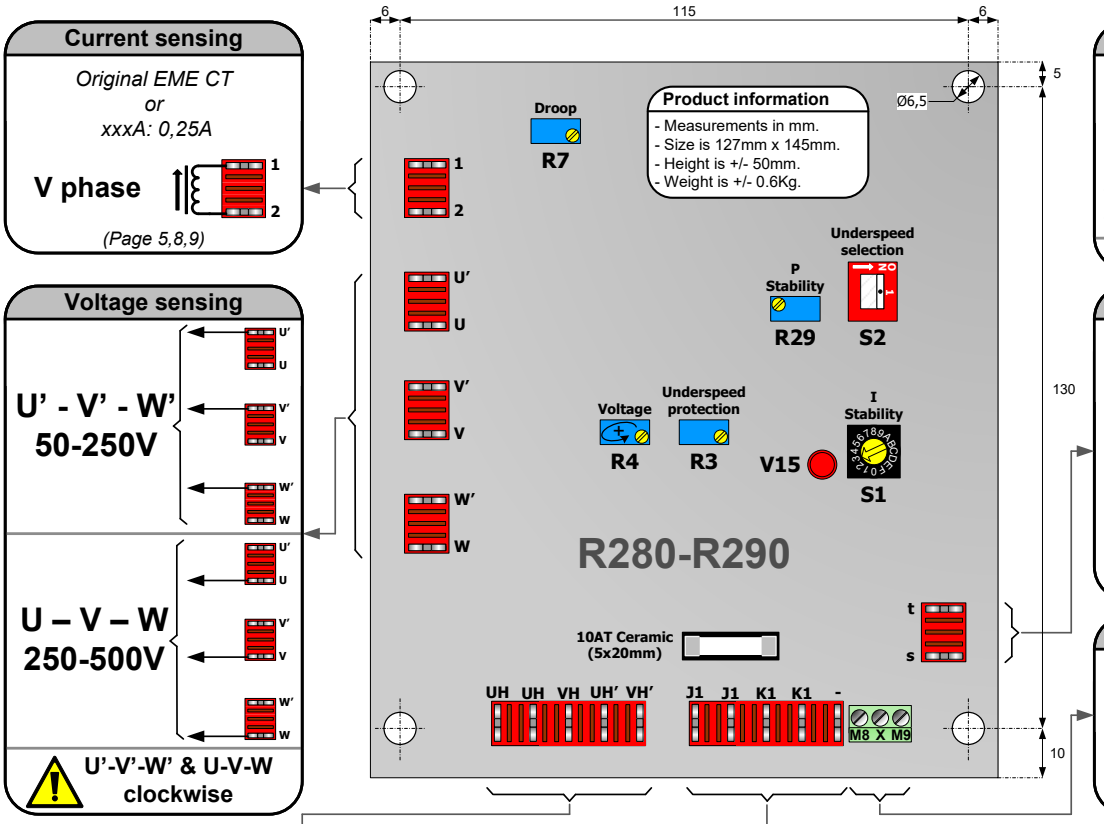
(Page 5,8,9)

Voltage sensing

U' - V' - W'
50-250V

U – V – W
250-500V

U'-V'-W' & U-V-W clockwise



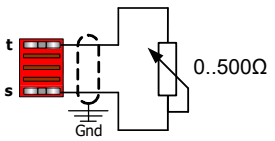
Factory settings

R7	: 50%
R4	: 400V (U -V- W)
R3	: 47Hz
R29	: 50%
S1	: Position "3"
S2	: On

Link : 1-2 & s-t

Remote adjust

Place link between s & t if no potentiometer is fitted



Max. value : 1KΩ

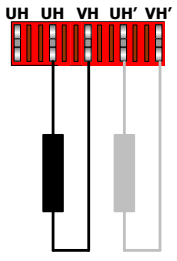
(Page 5)

Control input & output

M8 X M9

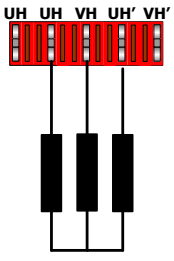
Wired according to wiring diagram by manufacturer.

AVR supply (Page 8,9)



Single- or two-phase

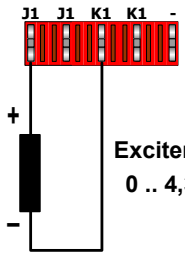
Max. rating: 75V +/- 20%



Three-phase

Max. rating: 70V +/- 20%

Exciter (Page 4,8,9)



Exciter Field
0 .. 4,3Adc

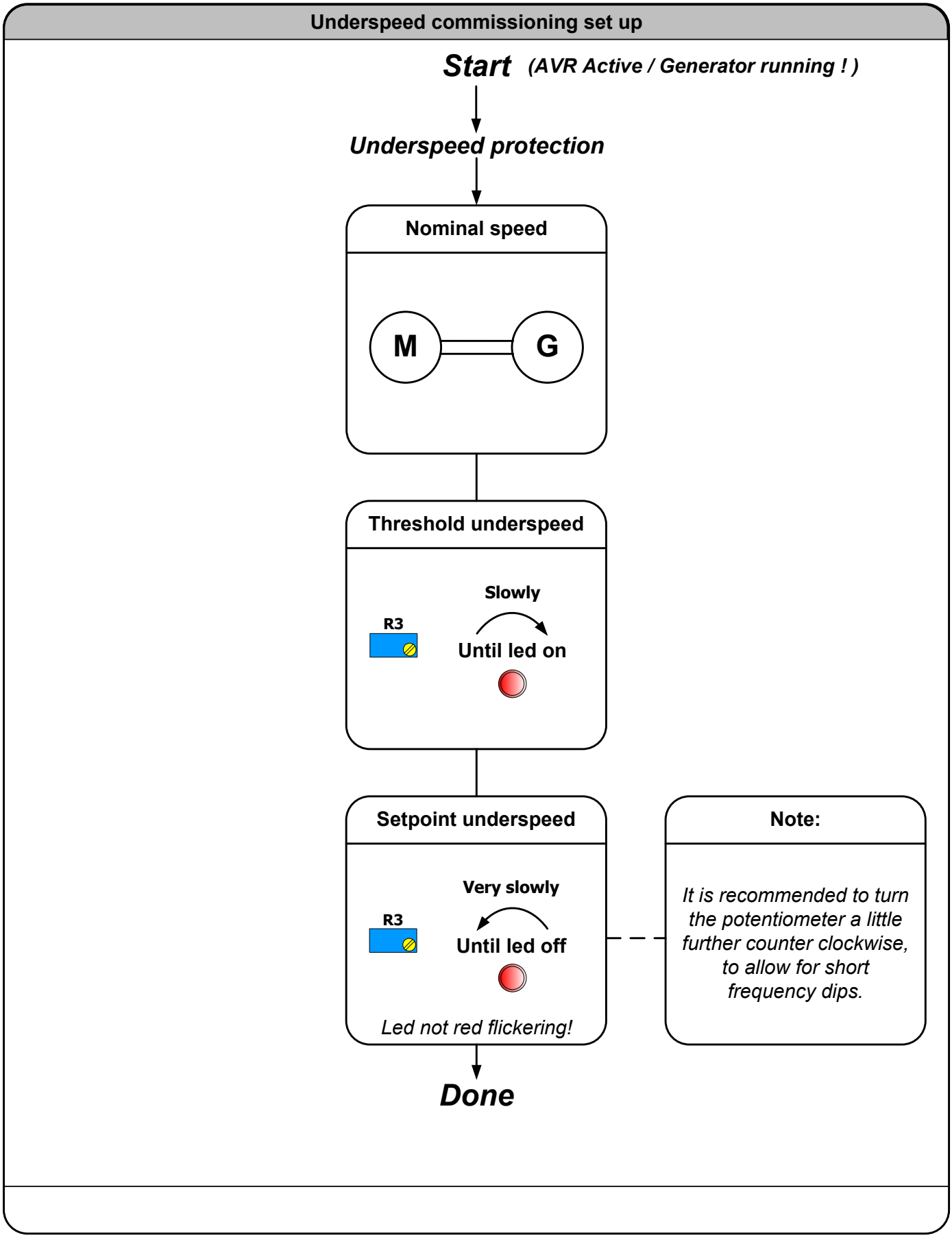
Max. rating:
Intermitted 6A < 10s.

Formula

Minimum field resistance

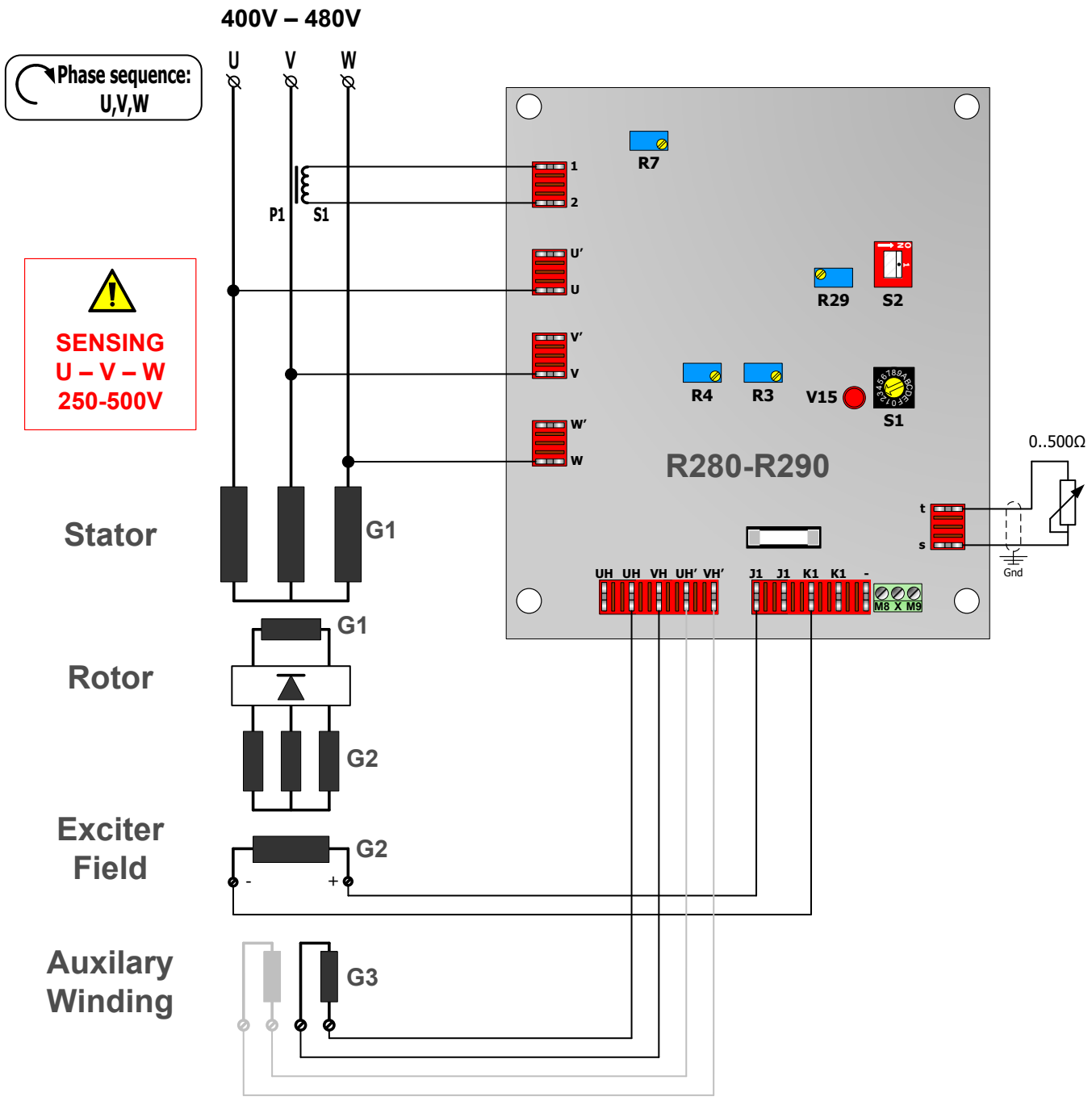
$$\text{Field resistance } (\Omega) \geq \frac{\text{Supply input} \times \sqrt{2}\ (V_{DC})}{10}$$

COMMISSIONING SET UP



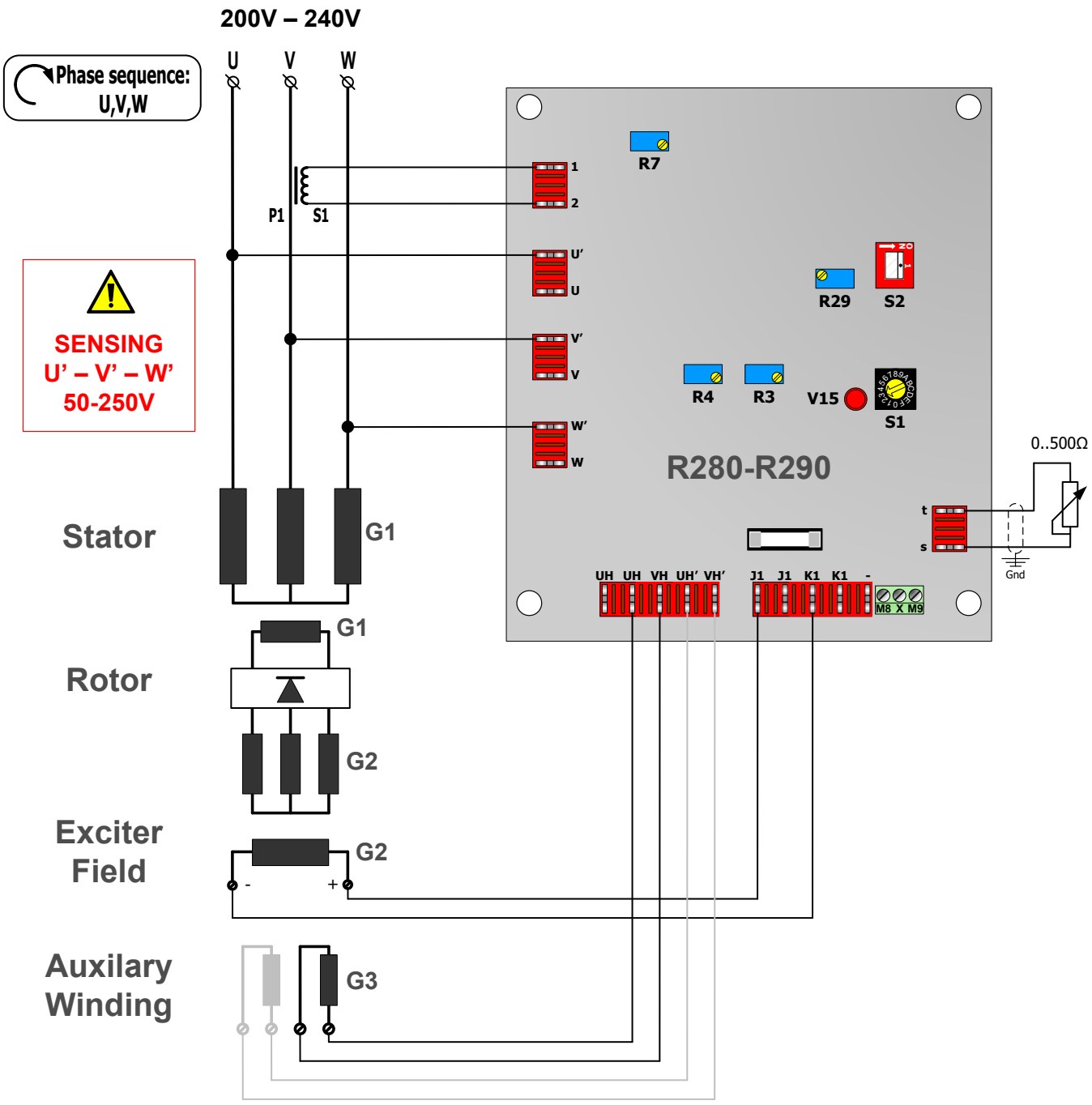
WIRING DIAGRAM I

AVR with 400V sensing and auxilary winding



WIRING DIAGRAM II

AVR with 230V sensing and auxilary winding



Empty

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 J1 (+) and K1 (-), 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 J1 (+) and K1 (-), 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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