

# Universal Hybrid Analog-Digital Voltage Regulator Operation Manual



Self Excited 5 Amp Analog / Digital Voltage Regulator For shunt and auxiliary windings generators With over-excitation and lost of sensing protection Use with Kutai EP200 Paralleling Module for parallel operation





### WARNING

1. Some generators even when working at high voltage are factory set to sense at lower voltages. Remember to set the DIP SW 2 to the sensing voltage not the working voltage of the generator even do sometimes it can be the same. If you have a 480/277V generator but you have the sensing wires C and A connected to 240 Volts move DIP SW 2 to ON

Another example are rental units with multi-voltage output with a switches for Y, YY, Delta & ZZ output, but sensing is always at 240V from T7 and T9 even though the generator is running sometimes at 480/277V.

- 2. All voltage readings are to be taken with an average-reading voltmeter Meggers and high-potential test equipment must not be used. Use of such equipment could damage the AVR.
- 3. Improper setting of under-frequency protection could cause the output voltage of the unit to drop or become unstable under with changes in load. Avoid making any changes to the U/F setting unless necessary.

# **SECTION 1 : SPECIFICATION**

#### Sensing Input (A, C) Average Reading

Voltage170 – 260 Vac @ 220 Vac, 1 phase 2 wires<br/>340 – 520 Vac @ 440 Vac, 1 phase 2 wires<br/>220/440 Vac, DIP switch settingFrequency50/60 Hz, DIP switch setting

### Power Input (B, C)

Voltage	100 – 300 Vac, 1 phase 2 wires
Frequency	40 – 60 Hz

### **Excitation Output (F+, F-)**

220V 1 phase	e Continuous 63 Vdc 5A		
	Max. 90 Vdc 7A for 10 secs.		
Resistance	Min. 15 ohms,	Max. 100 ohms	
Fuse Spec.	Slow blow 5 x 20mm S505-5A		

#### External Voltage Adjustment (EXT.VR)

Max. +/- 3.5% @ 1K ohm 1 watt potentiometer

#### **Voltage Regulation**

Less than +/- 0.5% ( with 4% engine governing )

### **Build Up Voltage**

5 Vac 25 Hz residual volts at power input terminal

### **EMI Suppression**

Internal electromagnetic interference filtering

### **Typical System Response**

Less than 20 milliseconds

### Soft Start Ramp Time

3 seconds +/- 10%

## **Static Power Dissipation**

Max.8 watts

#### **Under Frequency Protection (Factory Presets)**

50 Hz system presets knee point at 45 Hz 60 Hz system presets knee point at 55 Hz

#### **Over Excitation Voltage Protection**

When excitation output is greater than 40% of the Power Input, O/E protection will activate and shutdown excitation output after 5 seconds. This function can be turned off.

### **Voltage Thermal Drift**

Less than 3% at temperature range -40 to +70 °C

### **Under-Frequency Knee Point Thermal Drift**

Less than +/- 0.1 Hz at -40 to +70 °C

### Environment

Operating Temperature-40 to +60 °CStorage Temperature-40 to +85 °CRelative HumidityMax. 95%Vibration5 Gs @ 60 Hz

### Dimensions

121.0 (L) x 81.0 (W) x 44.5 (H) mm 4.76 (L) x 3.19 (W) x 1.75 (H) inch

### Weight

270 g +/- 2% 0.6 lb +/- 2%



# SECTION 2 : APPEARANCE / DIMENSIONS / INSTALLATION DRAWING

Figure 1 Outline Drawing

### ATTENTION

- 1. Only qualified technicians should install and operate the AVR.
- 2. The voltage regulator may be installed at any suitable location on the generator set (dimensions are shown in Figure 1). It is recommended that unit is mounted vertically with the green resistors on the regulator upwards to achieve the best cooling effect.
- 3. All AC voltage sensing readings are average value only.

# SECTION 3 : DIP SWITCH SETTINGS, LED INDICATORS AND ADJUSTMENTS



### ADJUSTMENTS AFTER GENERATOR IS STARTED :

- 1. First, turn VOLT and STAB trimpots fully counterclockwise before starting the generator. Set the engine governor to 50 or 60 Hz. Start the generator and wait till it reaches rated speed. Now slowly turn VOLT trimpot clockwise to increase the working voltage. (If you use an external potentiometer, set it to the center position). Keep EXT. VR shorted when not in use.
- Next, slowly adjusting the STAB trimpot etting (clockwise), this change the response time of the AVR to changing loads. If the setting is too high the voltage is unstable but if set too low the response is sluggish. We recommend using an analog DC voltage meter on F, F+ and adjust STAB for the lowest amount of voltage fluctuation (needle movement).
- 3. Last, Under Frequency (U/F) adjustment. (The U/F is Factory preset and needs no adjustments) put in rare applications. Use the U/F LED as a guide. When this LED is ON the circuit is operational turning off the regulators output. To recalibrate, adjust the generator speed to the new U/F kneel point, usually 5 Hz under rated speed (Hz) then set the U/F trim-pot to the point at which the U/F LED just changes from off to on rated speed (Hz) then set the U/F trimpot to the point at which the U/F LED just changes from off to on. Adjustment range for 50Hz system is 40 to 51 Hz. For 60 Hz system the range is 50 to 61 Hz.





Figure 3 170 – 260V sensing connection (Option 1)



Figure 5 340 - 520V sensing connection



Figure 4 170 – 260V sensing connection (Option 2)



Figure 6 Auxiliary Winding connection

% Package include 4 pcs of M4 L25 Round head bolts and 2 pcs of terminal jumpers.

% Use only replacement fuses specified in this user manual.

\* Appearance and specifications of products are subject to change for improvement without prior notice.