

# ADVR-2200M

## ***Universal Hybrid Analog-Digital Voltage Regulator Operation Manual***



Hybrid Universal Analog / Digital 1 or 3 Phase 3.5 Amp Self Excited, Shunt, Auxiliary Winding, Harmonic Power or PMG Automatic Voltage Regulator Easy to Set-Up and Program Install Manual

Use with KUTAI IVT-1260 / IVT-2460 add-on module can boost generator motor starting capacity.



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## SECTION 1 : SPECIFICATION

### Sensing Input (E1, E2, E3) Average Reading

|           |  |
|-----------|--|
| Voltage   | 220 – 600 Vac, 1 phase / 3 phase<br>DIP switch setting |
|           | 180 – 280 Vac @ 220 Vac                                |
|           | 330 – 515 Vac @ 380 / 440 Vac                          |
|           | 420 – 660 Vac @ 480 / 600 Vac                          |
| Frequency | 50/60 Hz, DIP switch setting                           |

### Power Input (P1, P2)

|           |                              |
|-----------|------------------------------|
| Voltage   | 60 – 300 Vac, 1 phase 2 wire |
| Frequency | 50 – 500 Hz                  |

### Auxiliary Input (P3, P4)

|           |                              |
|-----------|------------------------------|
| Voltage   | 40 – 300 Vac, 1 phase 2 wire |
| Frequency | 40 – 500 Hz                  |

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

|              |                                 |              |                 |
|--------------|---------------------------------|--------------|-----------------|
| 110V 1 phase | Continuous                      | 63 Vdc       | 3.5A            |
|              |                                 | Max. 90 Vdc  | 7A for 10 secs. |
| 220V 1 phase | Continuous                      | 125 Vdc      | 3.5A            |
|              |                                 | Max. 180 Vdc | 7A for 10 secs. |
| 220V 3 phase | Continuous                      | 150 Vdc      | 3.5A            |
|              |                                 | Max. 215 Vdc | 7A for 10 secs. |
| Resistance   | ≥ 18 ohms @ power input 110 Vac |              |                 |
|              | ≥ 36 ohms @ power input 220 Vac |              |                 |
|              | Max. 100 ohms                   |              |                 |
| Fuse Spec.   | Slow blow 5 x 20 mm S505-5A     |              |                 |

### External Voltage Adjustment (VR1, VR2)

|              |                                 |
|--------------|---------------------------------|
| Max. +/- 5%  | @ 500 ohms 1 watt potentiometer |
| Max. +/- 10% | @ 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

### Soft Start Ramp Time

4 seconds +/- 10%

### Typical System Response

Less than 20 milliseconds

### EMI Suppression

Internal electromagnetic interference filtering

### Static Power Dissipation

Max. 12 watts

### Burden in SHUNT & PMG Wiring

|                               |
|-------------------------------|
| 550 VA @ power input 110 Vac  |
| 1100 VA @ power input 220 Vac |

### Quadrature Droop Input (C1, C2)

|  |
|--|
| CT 1A or 5A greater than 5VA (DIP switch setting)  |
| Sensitivity +/- 7% @ PF +/- 0.5 (Droop adjustable) |

### Analogue Voltage Input (A1, A2)

|   |
|---|
| Input resistance greater than 2K ohms                   |
| Max. Input +/- 5 Vdc or +10 Vdc                         |
| Sensitivity 1 Vdc for 2.5% Generator Volts (adjustable) |

### 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 Protection

Set point 125 Vdc +/- 4 % @ power input 220 Vac  
Inverse-time curve. 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 °C  |
| Storage Temperature   | -40 to +85 °C  |
| Relative Humidity     | Max. 95%       |
| Vibration             | 5.5 Gs @ 60 Hz |

### Dimensions

|                                     |
|-------------------------------------|
| 150.0 (L) x 135.0 (W) x 55.5 (H) mm |
| 5.91 (L) x 5.31 (W) x 2.19 (H) inch |

### Weight

|                |
|----------------|
| 470 g +/- 2%   |
| 1.04 lb +/- 2% |

## SECTION 2 : OUTLINE / SIZE / INSTALLATION REFERENCE

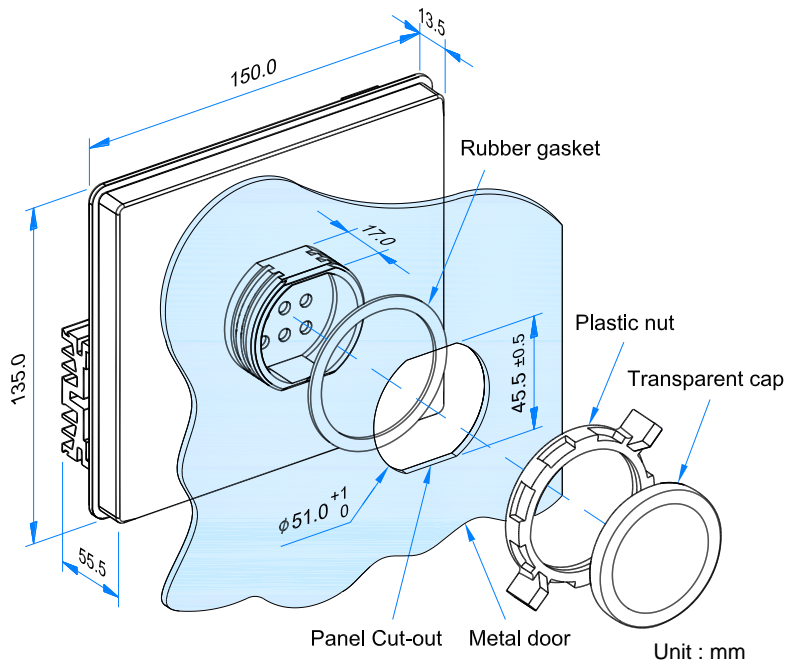


Figure 1 Outline Drawing

### ATTENTION

1. AVR can be mounted directly on the engine, genset, switchgear, control panel, or any position that will not affect operation. For dimension reference, please see Figure 1.
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. Terminal : "Fast-On" terminals 6.35 mm (1/4 inch).
4. 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.
5. Turn off O/E in AVR when paralleling.

## SECTION 3 : DIP SWITCH PROGRAMMING



|     |                  |     |                     |
|-----|------------------|-----|---------------------|
| SW1 | 1.OFF 2.OFF 220V | SW2 | 4.OFF 5.OFF <90KW   |
|     | 1.OFF 2.ON 380V  |     | 4.ON 5.OFF 90~500KW |
|     | 1.ON 2.ON 480V   |     | 4.ON 5.ON >500KW    |

|     |   | OFF            | ON              |
|-----|---|----------------|-----------------|
| SW2 | 1 | 1 PHASE        | 3 PHASE         |
|     | 2 | 60Hz           | 50Hz            |
|     | 3 | O/E PROTECT ON | O/E PROTECT OFF |
|     | 6 | CT 1A          | CT 5A           |

| SW1   |
|---|
| SW1-1 & SW1-2 Sets the Generators Sensing Voltage |
| SW2   |
| SW2-1 Set Sensing Voltage for 1 or 3 Phase        |
| SW2-2 Set Generator Frequency                     |
| SW2-3 Set Over Excitation Protection ON or OFF    |
| SW2-4 & 5 Sets Generator Capacity                 |
| SW2-6 Sets Capacity of Droop CT                   |

## SECTION 4 : ADJUSTMENTS

**U/F** Under Frequency Protection Adjustment When generator speed falls below the knee point, the under frequency protection circuit will activate and the voltage and frequency begin to decrease in linear descend.

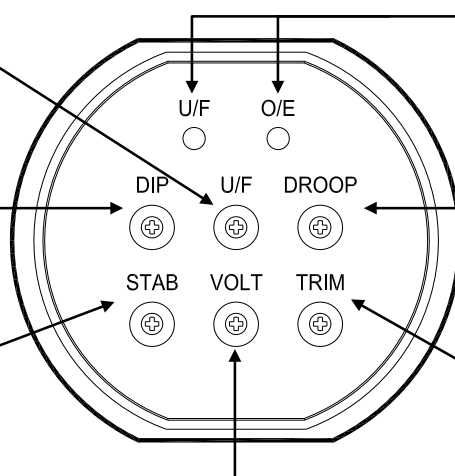
Select frequency 50 or 60 Hz according to the generator in use.

### DIP U/F Dip Adjustment

When U/F protection is activated, the voltage droop ratio can be adjusted via this DIP (POT). The adjustable range is 3–10 V/Hz.

### STAB Stability Adjustment

Correct stability adjustment must be conducted while the generator is operating without load. First adjust the STAB potentiometer (POT) anti-clockwise until the voltage becomes unstable, and then slightly adjust it clockwise (About 1/5 turn). When the voltage just reaches the critical point (Knee point) of stabilization, where the voltage is stable yet very close to becoming unstable.



**LED** Indicator lit up when the generator is in U/F (Under Frequency Protection) and O/E (Over Excitation Protection).

### DROOP Droop Adjustment

When paralleling, the AVR increase or decrease its voltage output, when phase current leads or lag the voltage. The increase and decrease range can be preset by the DROOP adjustment.

### TRIM Trim Adjustment

When terminal A1 and A2 are biased with a DC voltage (0–10V), the TRIM is then used to adjust the influence on the output voltage of the AVR. If the TRIM (POT) is adjusted fully counter-clockwise, any bias voltage will not cause any influence. On the contrary if the TRIM is adjusted fully clockwise, then any signal will produce a maximum 10% effect.

### VOLT Voltage Adjustment

Generator rated output voltage adjustment.

Must be in accordance with the DIP Switch SW1-1 & 2 voltage range setting.

Figure 2

## SECTION 5 : WIRING CONNECTIONS

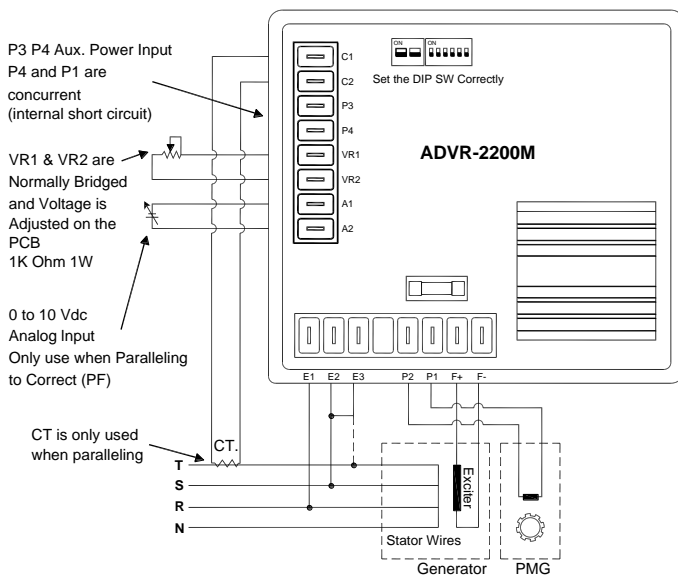


Figure 3 PMG Connection

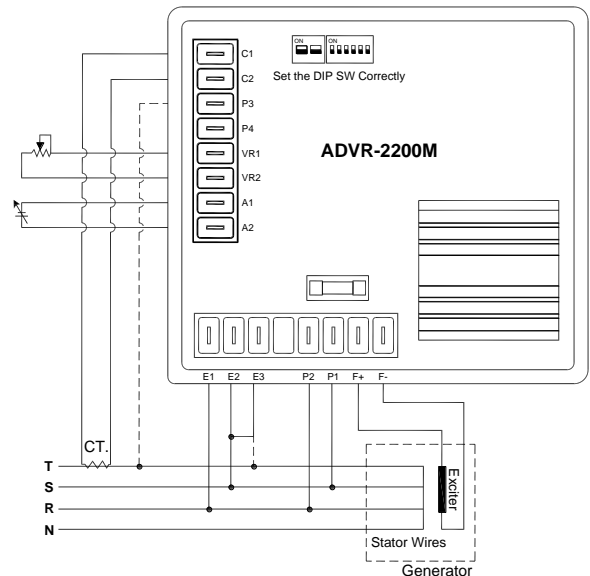


Figure 4 Shunt Connection (220V)

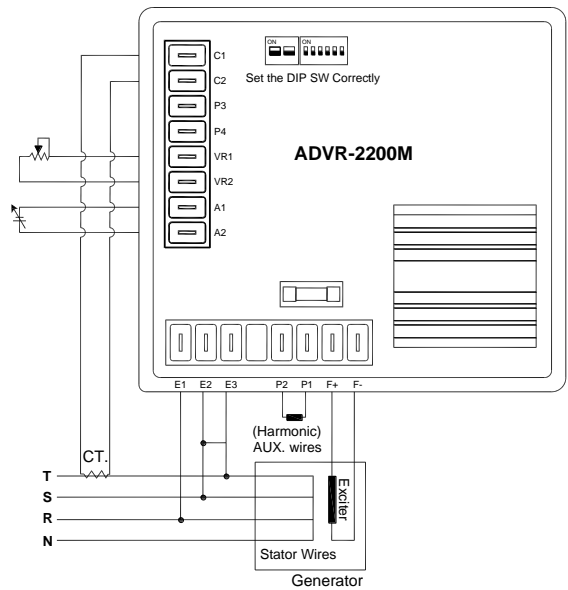


Figure 5 Auxiliary Winding (AUX.) Connection

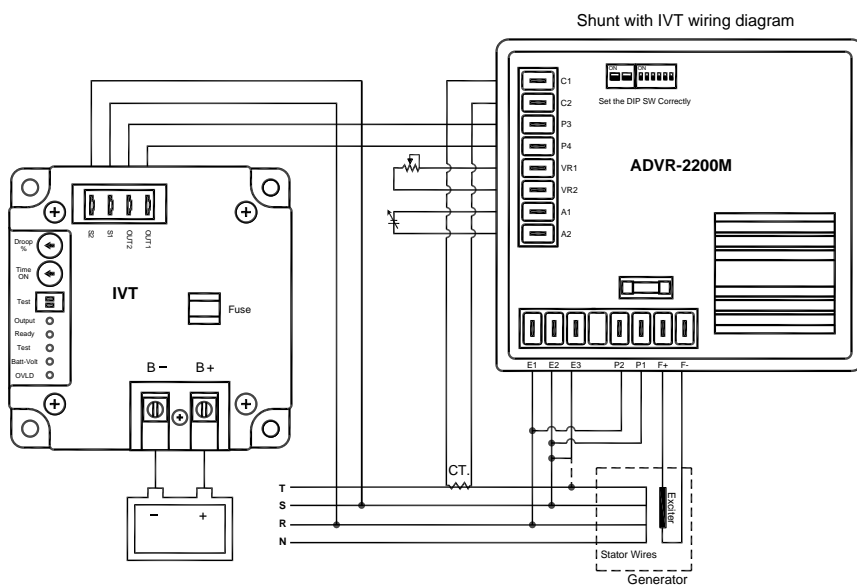


Figure 6 AVR-2200M & IVT-1260 / IVT-2460 Wiring Connection

#### ATTENTION

1. All AC voltage readings are average value only.
2. Use a remote 500 ohms 1 watt external VR for +/- 5% adjustment range. (keep shorted if not used)
3. Use a remote 1K ohm 1 watt external VR for +/- 10% adjustment range.
4. Sensing Voltage can be set from 220 – 600 Vac Program SW1-1 & 2 correctly.
5. For single phase sensing bridge E2 & E3 and move SW2-1 to OFF.
6. If your PMG is not working you can also power the AVR in shunt using terminals P1 & P2 connected to the output of the generator as long as it's less than 277 Vac.

※ Use only the replacement fuses specified in this user manual.

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