

DM730 Digital Automatic Voltage Regulator  
(AVR)

**SPECIFICATION, CONTROLS AND  
ACCESSORIES**



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# 1 Description

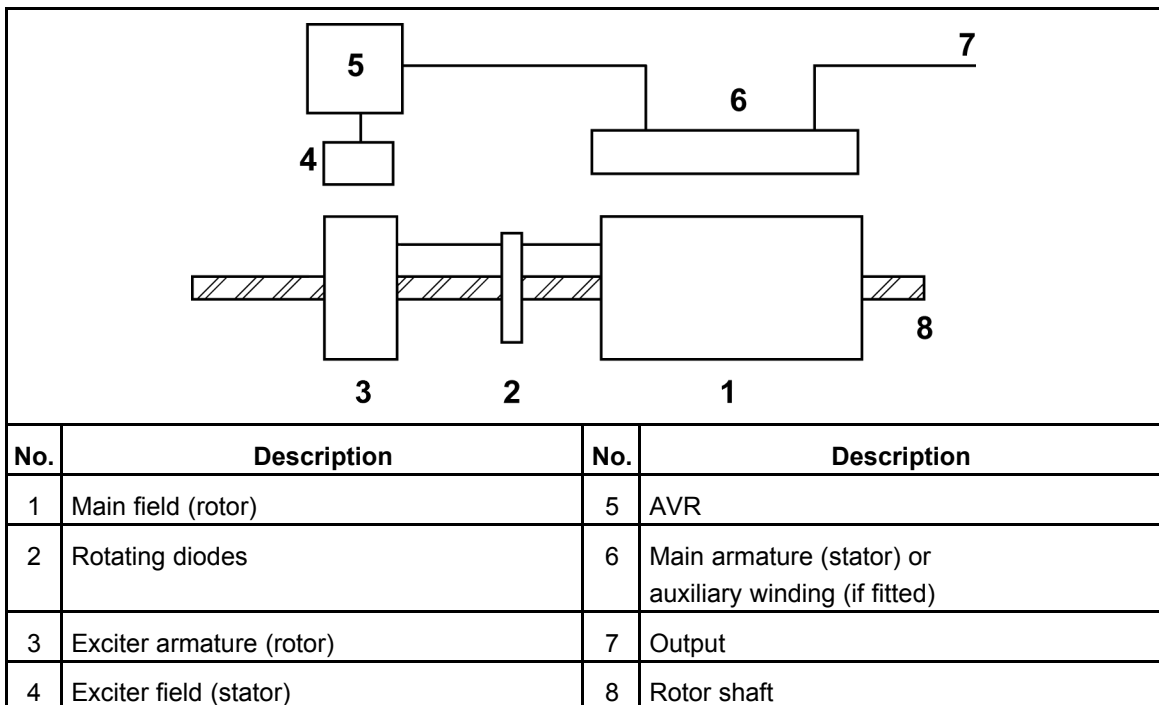
## 1.1 Self-Excited AVR Controlled Alternators

A self-excited AVR receives power from the alternator output terminals or Auxiliary Winding. The AVR controls the alternator output voltage by automatic adjustment of the exciter stator field strength.

### 1.1.1 Main Stator Powered AVR

The AVR provides closed loop control by sensing the alternator output voltage at the main stator windings and adjusting the exciter stator field strength. Voltage induced in the exciter rotor, rectified by the rotating diodes, magnetises the rotating main field which induces voltage in the main stator windings. A self-excited AVR receives power from the alternator output terminals or a special auxiliary winding in the main stator winding.

TABLE 1. MAIN STATOR POWERED AVR



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# 2 Specification

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## 2.1 DM730 Technical Specification

- **Sensing Input**
  - Voltage: 170 VAC to 305 VAC
  - Frequency: 50 Hz to 60 Hz nominal
- **Power Input**
  - Voltage: 170 AC to 305 VAC
  - Frequency: 50 Hz to 60 Hz nominal
- **Power Output**
  - Voltage: maximum 140 VDC
  - Current
    - Continuous: 5A
    - Transient: 7A for 60 seconds
    - Transient: 10A for 15 seconds
  - Resistance: 15Ω minimum at 20 °C
- **Regulation**
  - +/- 1.0% RMS<sup>1</sup>
- **Thermal Drift**
  - Typically 0.05% per 1°C change in AVR ambient temperature<sup>2</sup>
- **Typical Response**
  - AVR response in 20ms
  - Field current to 90% in 80ms
  - Machine Volts to 97% in 300ms
- **External Voltage Adjustment**
  - +/- 10% with 1kΩ, trimmer
- **Under-Frequency Protection**
  - Set point 95% Hz of nominal (50 or 60 Hz)<sup>3</sup>
- **Unit Power Dissipation**
  - 12W maximum
- **Build-up Voltage**
  - 4 VAC at AVR terminals
- **Quadrature Droop Input**
  - 10Ω burden
  - Maximum sensitivity: 0.07A for 5% droop, zero power factor

<sup>1</sup> With 4% engine governing

<sup>2</sup> After 10 minutes

<sup>3</sup> Factory set

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- Maximum input: 0.33A
  - **Over-Voltage Detection**
    - Set point:140 VDC
    - Time delay: 1 minute
    - Red LED blinking
  - **Environmental**
    - Operating temperature: -40°C to +70°C<sup>4</sup>
    - Relative Humidity 0°C to 70°C: 95%<sup>5</sup>
    - Storage temperature: -55 °C to +80 °C

<sup>4</sup> De-rate output current by 5% per 1°C above 60°C

<sup>5</sup> Non condensing



# 3 Controls

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 **DANGER**

***Live Electrical Conductors***

***Live electrical conductors can cause serious injury or death by electric shock and burns.***

***To prevent injury and before removing covers over electrical conductors, isolate the generator set from all energy sources, remove stored energy and use lock out/tag out safety procedures.***

 **DANGER**

***Live Electrical Conductors***

***Live electrical conductors at output, AVR and AVR accessory terminals, and AVR heat sink can cause serious injury or death by electric shock and burns.***

***To prevent injury, take suitable precautions to prevent contact with live conductors including personal protective equipment, insulation, barriers and insulated tools.***

**NOTICE**

**Refer to alternator wiring daigram for connection details.**

## 3.1 DM730 Controls

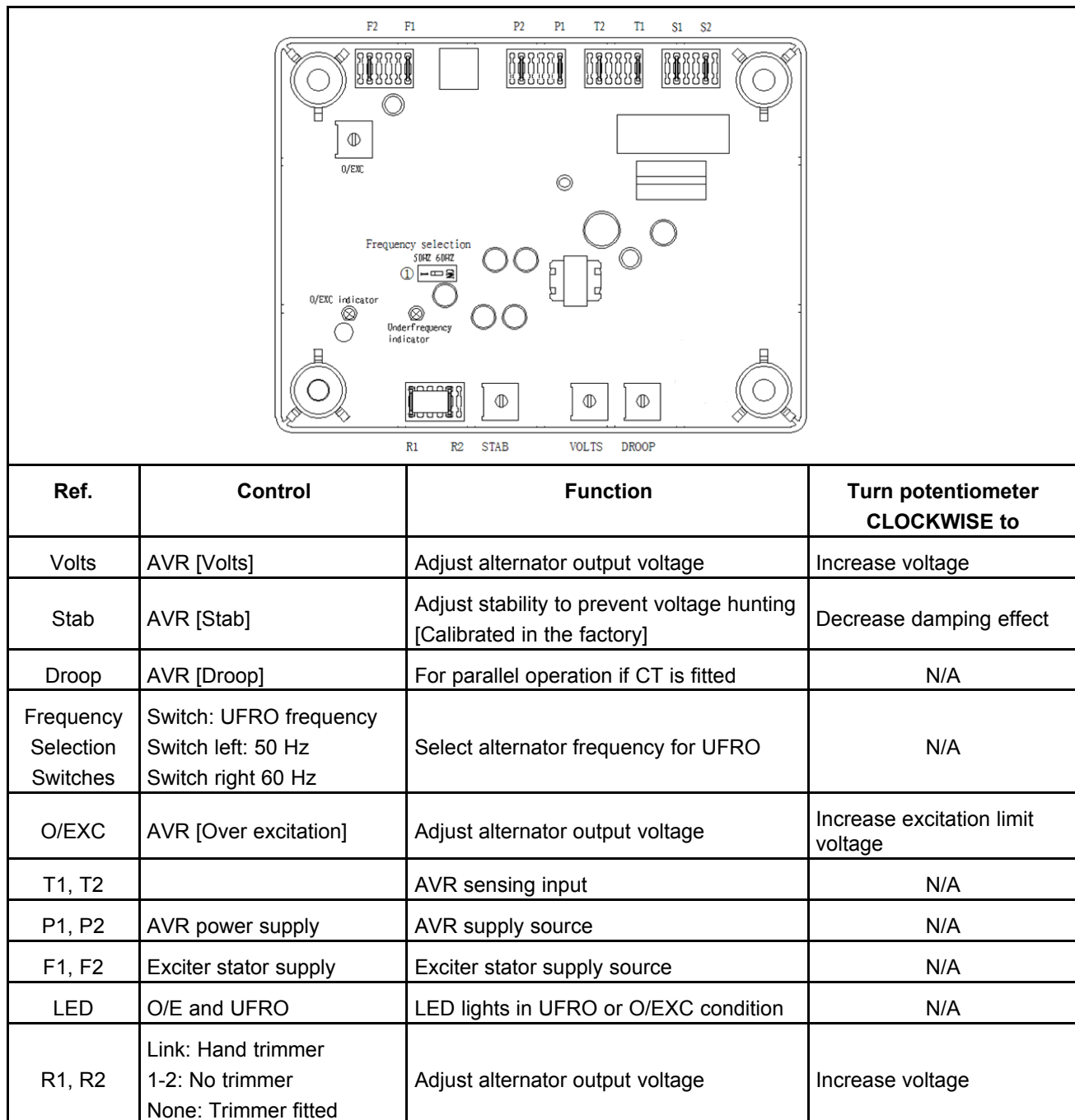


FIGURE 1. DM730 AVR CONTROLS

## 3.2 Initial AVR Setup

### NOTICE

The AVR must be setup only by authorised, trained service Personnel. Do not exceed the designed safe operating voltage, shown on the alternator rating plate.

The AVR controls are set at the factory for initial running tests. Check that the AVR settings are compatible with the required output of the end user. Do not adjust controls that have been sealed. To set up a replacement AVR, follow these steps:

1. Stop and isolate the generator set.
2. Install and connect the AVR.
3. Turn the **AVR [VOLTS]** volts control [Section 3.3](#) fully counter-clockwise.
4. Turn the hand trimmer (if fitted) to 50%, the midway position.
5. Turn the **AVR [STAB]** stability control [Section 3.4](#) to 25%.
6. Connect a suitable voltmeter (0 to 300 VAC range) between one output phase and neutral.
7. Start the generator set with no load.
8. Carefully turn **AVR [VOLTS]** control clockwise until the voltmeter shows rated voltage.
9. If voltage is unstable, adjust the **AVR [STAB]** stability control.
10. Re-adjust the **AVR [VOLTS]** control, as needed.

### 3.3 Adjust the AVR [VOLTS] Voltage Control

#### NOTICE

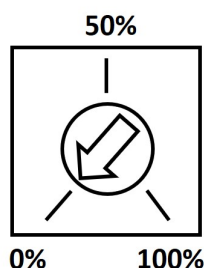
Do not exceed the designed safe operating voltage, shown on the alternator rating plate.

#### NOTICE

Hand trimmer terminals may be above earth potential. Do not ground any of the hand trimmer terminals. Grounding hand trimmer terminals could cause equipment damage.

To set the output voltage AVR [VOLTS] control on the AVR:

1. Check the alternator nameplate to confirm the designed safe operating voltage.
2. Set the **AVR [VOLTS]** control to 0%, the fully counter-clockwise position.



3. Check that the remote hand trimmer is fitted or terminals R1 and R2 are linked.

#### NOTICE

If a remote hand trimmer is connected, set it to 50%, the midway position. When R1 and R2 are linked the terminal voltage will drop to the min level of hand trimmer.

4. Turn the **AVR [STAB]** control to 50%, the midway position.
5. Start the alternator and set at the correct operating speed.
6. Adjust the **AVR [VOLTS]** control slowly clockwise to increase the output voltage.

#### NOTICE

If the voltage is unstable set the AVR stability before proceeding [Section 3.4](#)

7. Adjust the output voltage to the desired nominal value (VAC).
8. If instability is present at rated voltage, refer to the **AVR [STAB]** adjustment, then adjust **AVR [VOLTS]** again, if necessary.
9. If a remote hand trimmer is connected, check its operation.

**NOTICE**  
0% to 100% rotation corresponds to 90% to 110% VAC

The **AVR [VOLTS]** control is now set.

### 3.4 Adjust the AVR [STAB] Stability Control

1. Check the nameplate to confirm the power rating of the alternator.
2. Check the frequency selection switch matches the alternator rating.
3. Set the **AVR [STAB]** control to approximately 25% position.



4. Start the alternator and set at the correct operating speed.
5. Verify that the alternator voltage is within safe limits.

**NOTICE**  
If the voltage is unstable go immediately to step 5.

6. Adjust the **AVR [STAB]** control slowly clockwise until the output voltage becomes unstable.
7. Adjust the **AVR [STAB]** control slowly counter-clockwise until the voltage is stable.
8. Adjust the **AVR [STAB]** control a further 10% clockwise.

**NOTICE**  
Readjust the voltage level if necessary (see [Section 3.3](#)).

The **AVR [STAB]** control is now set.

### 3.5 Adjust the AVR [EXC] Over-Excitation Control

**NOTICE**  
The AVR [EXC] control is set and sealed at the factory to protect the alternator from over-excitation, usually caused by overload. Incorrect AVR [EXC] control setting could damage the alternator rotor components.

The AVR protects the alternator by removing excitation if it senses that the excitation voltage exceeds a threshold set by the **AVR [EXC]** control.

1. If the excitation voltage exceeds the over-excitation trip setting, the red LED on the AVR turns on.

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2. After a short time, the AVR removes the excitation voltage and the red LED flashes (which can also indicate an over-voltage trip or UFRO operation).
  3. Stop the alternator to reset the over-excitation condition.

## 3.6 Adjust the AVR [DROOP] Voltage Droop Control for Parallel Operation (If CT is fitted)

A correctly fitted and adjusted droop current transformer (CT) allows the alternator to share reactive current for stable parallel operation.

1. Mount the Droop CT to the correct phase lead of the main output windings of the alternator.
2. Connect the two secondary leads marked S1 and S2 from the CT to the terminals S1 and S2 of the AVR.
3. Turn the **AVR [DROOP]** control to the midway position.
4. Start the alternator(s) and set at the correct operating speed and voltage.
5. Parallel the alternator(s) according to installation rules and procedures.
6. Set the **AVR [DROOP]** control to produce the required balance between individual alternator output currents. Set the AVR droop off-load and then check the currents when the output load is applied, on-load.
7. If the individual alternator output currents rise (or fall) in an uncontrolled way, isolate and stop the alternators then check that:
  - The droop transformer is fitted to the correct phase and in the correct polarity (see the machine wiring diagrams).
  - The droop transformer secondary S1 and S2 leads are connected to the AVR terminals S1 and S2.
  - The droop transformer is the correct rating.

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## 4 AVR Accessories

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Accessories to support AVR functions are factory-fitted or supplied separately with instructions for fitting and wiring by a competent technician.

### 4.1 Hand Trimmer (for remote voltage adjustment)

A hand trimmer can be fitted in a convenient position (typically in the generator set control panel) and connected to the AVR to provide fine adjustment of the alternator voltage. The hand trimmer value and the adjustment range obtained is as defined in the Technical Specification. Refer to wiring diagram before removing the shorting link and connecting the hand trimmer.

### 4.2 Droop Transformer (for parallel operation – alternator to alternator)

A droop transformer can be fitted in a defined position in the alternator main output wiring and connected to the AVR to enable parallel operation with other alternators. The adjustment range is as defined in the AVR manual. Refer to wiring diagram before removing the shorting link and connecting the droop transformer. The droop transformer **MUST** be connected in the correct main output terminal for proper operation (details are as shown in the machine wiring diagram).

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