

# **Hand-Crank AC/DC Generator User Manual**

Item Code: SER1052034

## **I. Product Overview**

This instrument demonstrates the physical principles of DC motors, as well as AC and DC generators. It is suitable for teaching experiments and teacher-led demonstrations.



## **II. Structure and Components**

- 1. Magnetic Field Section:** A magnetic field is generated by a magnet and a pair of pole shoes.
- 2. Armature Section:** The armature core is made of pure iron and is wound with hundreds of turns of enamelled wire. The ends of the coil are soldered to two copper rings. The copper rings are divided into a commutator (semi-circular part) and a slip ring (full circular part). The two rings are nested on the same cylinder and are insulated from each other.
- 3. Rotor Section:** The armature and copper rings are fixed on the same rotating shaft. The other end of the shaft is equipped with a pulley, and both sides are positioned at the centre of the pole shoes by bearing plates.
- 4. Brush Assembly:** A pair of phosphor bronze brushes are installed on the bearing frame on the slip ring side. The brushes can move back and forth on the sliding rod and are used to output DC or AC current.
- 5. Base Section:** The entire device is mounted on a base, which includes 4 terminals, connecting wires, a lamp holder, and a bulb.

### **III. Performance Parameters**

When the rotor speed is 1600 rpm:

- **No-load output voltage:** Not less than 8V (DC or AC).
- **Load output voltage:** When the load is a 4.8V/0.3A small bulb, the load voltage is not less than 5V.

### **IV. Usage Instructions**

#### **(A) DC Motor Experiment**

1. Adjust the two brushes to the middle (semi-circular) part of the slip ring, ensuring good contact and moderate pressure.
2. Connect an external power source (DC 6-8V) to terminals d and b using connecting wires.
3. Turn on the power and observe the rotation of the armature. By changing the voltage and current direction, you can observe changes in the armature's speed and direction of rotation.
4. **Note:** Since this is a single-winding motor, if the armature is in a dead spot, manually rotate the rotor to assist start-up.

#### **(B) Generator Experiment**

##### **1. Preparation:**

- Install the crank on the outside of the handwheel.
- Install the small bulb in the lamp holder.
- Attach the drive belt.

##### **2. Brush Adjustment:**

- For DC output: Press the brushes against the semi-circular part of the copper ring.
- For AC output: Press the brushes against the full circular part of the copper ring.

##### **3. Load Connection:**

- For bulb load: Connect terminals a and c.
- For external load: Connect terminals a and b.

##### **4. Operation Steps:**

- Hold the base with one hand and crank the handwheel steadily with the other.
- The bulb should light up after cranking the handle.

- **Note:** Avoid cranking too fast to prevent burning out the bulb.

5. **Electric Meter Demonstration:** Use a pointer-type demonstration meter to display AC or DC current. Select the appropriate meter range during the experiment.

## **V. Maintenance and Care**

1. **Troubleshooting:** Most instrument failures are caused by loose or broken wires (due to moisture or corrosion). If the generator does not produce electricity when cranked, use a multimeter to check if the circuit is open.

2. **Clearing Debris:** The small gap between the armature and pole shoes can easily trap debris, causing jamming. Temporarily remove the magnet for cleaning if necessary.

3. **Lubrication:** Regularly apply an appropriate amount of lubricating oil to the rotor bearings to maintain smooth operation.

4. **Storage Precautions:** When not in use, remove the belt and avoid exposure to oil, high temperatures, and direct sunlight.