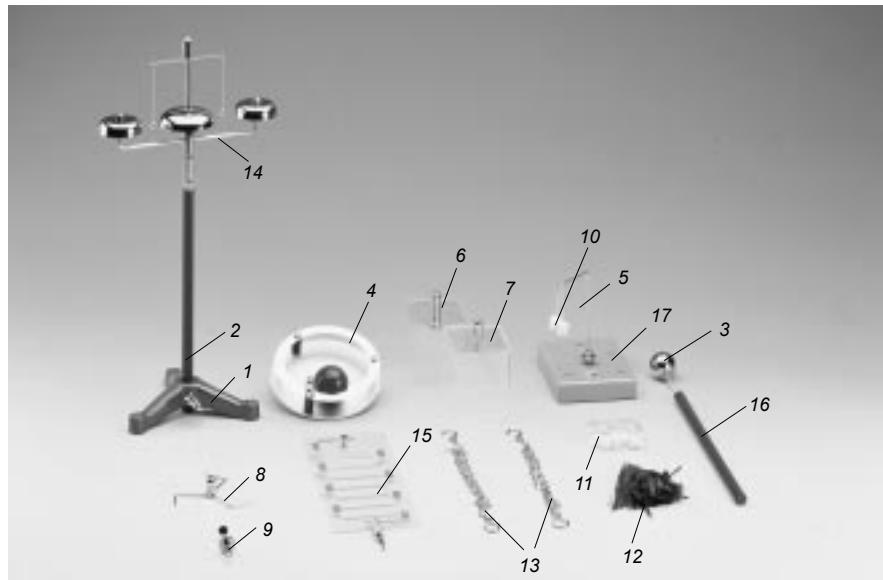


## Operating Instructions


**1 PURPOSE**

A range of phenomena in the field of electrostatics can be impressively demonstrated with the Set of Electrostatics Apparatus 07644.00.

**2 OPERATION**

The Van de Graaff Generator 07643.93 is suitable as a high voltage source; the current levels drawn from this device are very low (short-circuit current < about 10 $\mu$ A), so that experimenting is not hazardous despite high voltages of 150 ... 200kV.

The set of electrostatics apparatus contains:

- 1 support base
- 2 support rod with holding and connecting sleeve
- 3 ball with plug pin
- 4 base plate with plug pin and attachment for ball movement
- 5 hook support arm
- 6 casing with spherical electrode
- 7 casing with needle electrode
- 8 wheel with pointed spokes
- 9 needle bearing with plug pin
- 10 pith ball double pendulum
- 11 pieces of pith (10)
- 12 bunch of paper
- 13 chains (2)
- 14 bell support
- 15 lightning board
- 16 friction rod with 4mm hole
- 17 storage rack

To carry out the experiments the apparatus must be insulated from the surroundings by either attaching them directly to the supports 1 and 2 or by suspending them from the arm 5. The tip of the insulating rod is in electrical contact with the attached device.

Depending on the experiment objective, the apparatus either forms the end of an open electrical circuit (rotating wheel, bunch of paper) or it forms part of a closed circuit. In the former case the live pole of the Van de Graaff generator must be connected, but not its earth pole. In the second case both poles should be connected to the apparatus. This is easiest using connection leads fitted with crocodile clips for attachment to the contact lug on the insulation post and to the device. For practical reasons the upper device connection should be connected to the cover of the generator and the lower device connection to its earth pole.

The high voltage should be applied by operating the Van de Graaff generator only when all experiment preparation has been completed.

**Chiming bells**

The central bell is connected to the live pole via the upper lug and the outside bells are connected to the earth pole via the support lug.

Due to charge reversals, any insulated metal body swings to and fro between the central and outside bells („Electrostatic Pendulum“).

### **Air purifier**

The casing with the needle electrode is filled with smoke (e.g. with an incense cone). The needle electrode is connected to the live pole on the Van de Graaff generator and the bottom electrode to its earthed pole. The smoke particles become charged and are rapidly deposited.

### **Dancing balls**

Some pieces of pith, formed into balls, are placed in the casing with spherical electrodes. The connections are the same as for the air purifier. The pith balls move up and down in the chamber due to charge reversal processes.

### **Moving ball**

Where the ball touches one of the electrically charged metal electrodes, the surface becomes locally charged and the ball starts to roll due to repulsion forces.

### **Lightning board**

The angled hook is inserted into the insulating post on the support base from which the device being used is suspended. Its upper connection then forms an electrical connection with the tip of the insulating post and the live pole of the Van de Graaff generator is connected to this point. The lower device connection is connected to the earthed pole. Sparks are formed at the gaps in the metal covering. They form at all conductor gaps simultaneously.

### **Rotating wheel**

The needle bearing must first be inserted in the support post and the spoked wheel placed on it. The live pole of the Van de Graaff generator is then connected to the support post. Electrical point discharges set the wheel turning due to reaction effects.

### **Bunch of paper**

The bunch of paper is placed on the support post to which the live pole of the Van de Graaff generator is connected. The paper strips are forced apart by electrostatic forces.

### **Double pendulum**

The hook support arm with the pith ball double pendulum is held by the support post. Using the friction rod with the ball attached, a charge is transferred from the Van de Graaff generator to the pith balls. The two pendulums are repelled away from one another by the electrostatic repulsion forces.