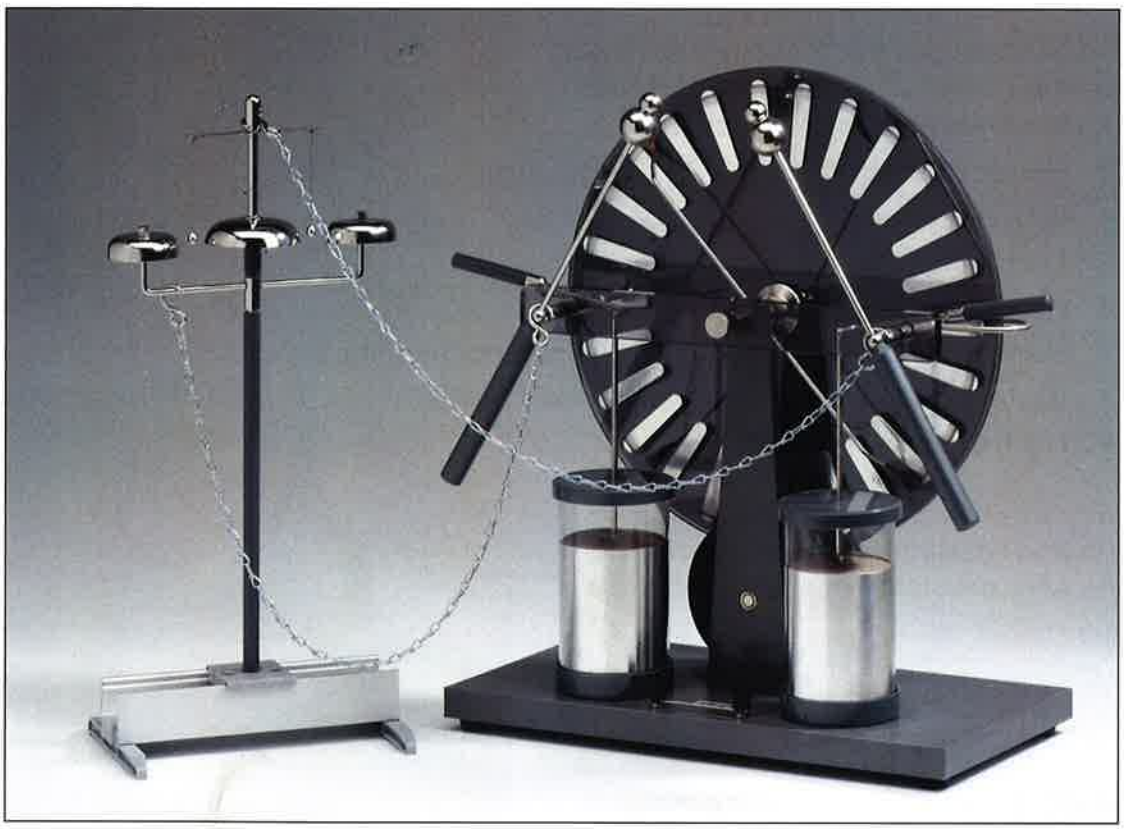
Armario 3
Balda 3. Maletín. Wimshurst.

Experiment description/Manual

Demonstration kit

Electrostatics



Cornelsen
EXPERIMENTA

Demonstration kit

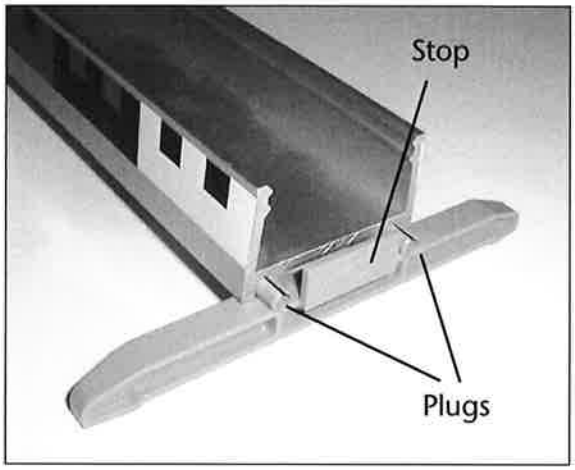
Electrostatics

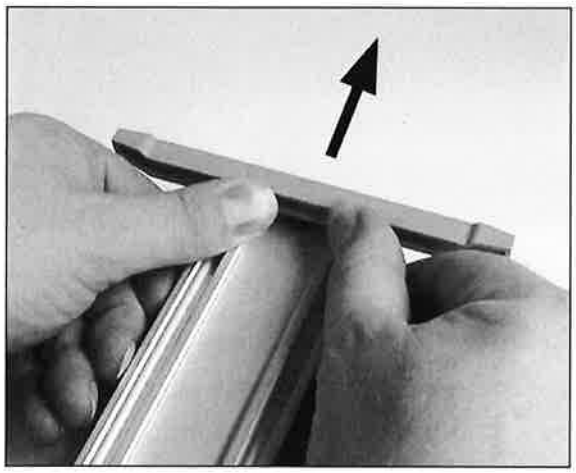
Order number 50332

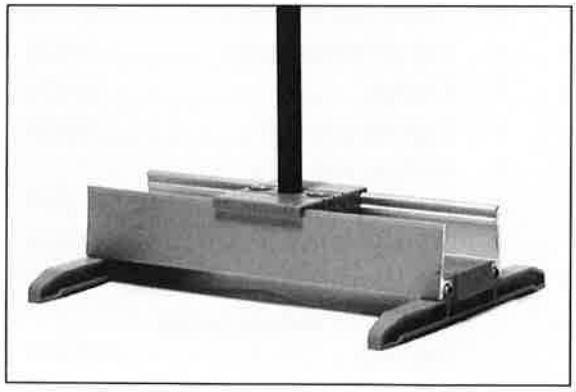
Contents

General instructions/Notes on setting up the experiments

With this equipment kit experiments on the constant electrical field can be performed in a graphic manner. The success of electrostatic experiments depends to a large degree on the prevailing humidity. In particular the deposit of damp precipitation during severe temperature fluctuations must be avoided. You might have to use an absorbent cloth to dry off the individual parts of the equipment kit beforehand.
A Wimshurst (electrostatic) machine or a Van de Graaff generator can be used as a high-voltage source. In some experiments it is necessary to limit the electrical charge using correspondingly low rotation speeds or disconnecting the Leyden jars as otherwise sparks or flashovers could severely impair the experiment results.







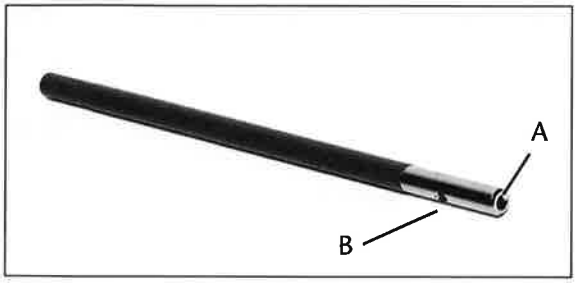
Assembling the stand base:

The feet for rail are plugged lateraly into the rail profile. Please take care that the feet are inserted as far as the stop and that they are straight.
Mounting of the feet can be eased by the application of a little silicone grease inside the grooves.

Keep the feet straight when pushing them off. The best way to remove the feet is to turn the rail upside down and use your thumbs to press the feet out of the rail.

The clamp slider is clipped on the rail profile in central position. Use the central bore of the clamp slider to fix the insolating rod.

Insolating rod: The rod has two 4-mm bore holes. The axial bore hole (A) is used to retain various components, the lateral socket (B) is used to connect a charge source.



Electrostatics

Overview of the components

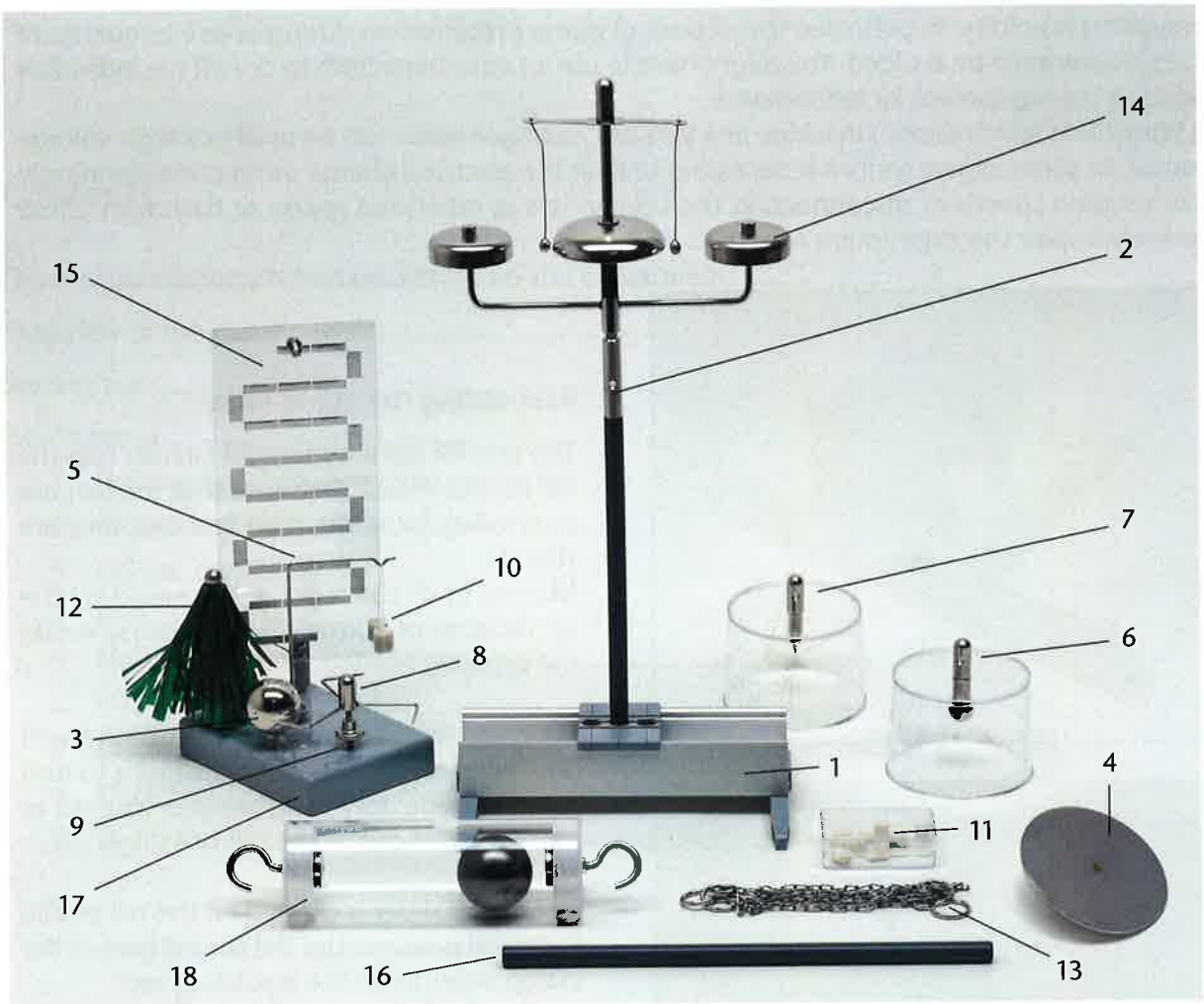
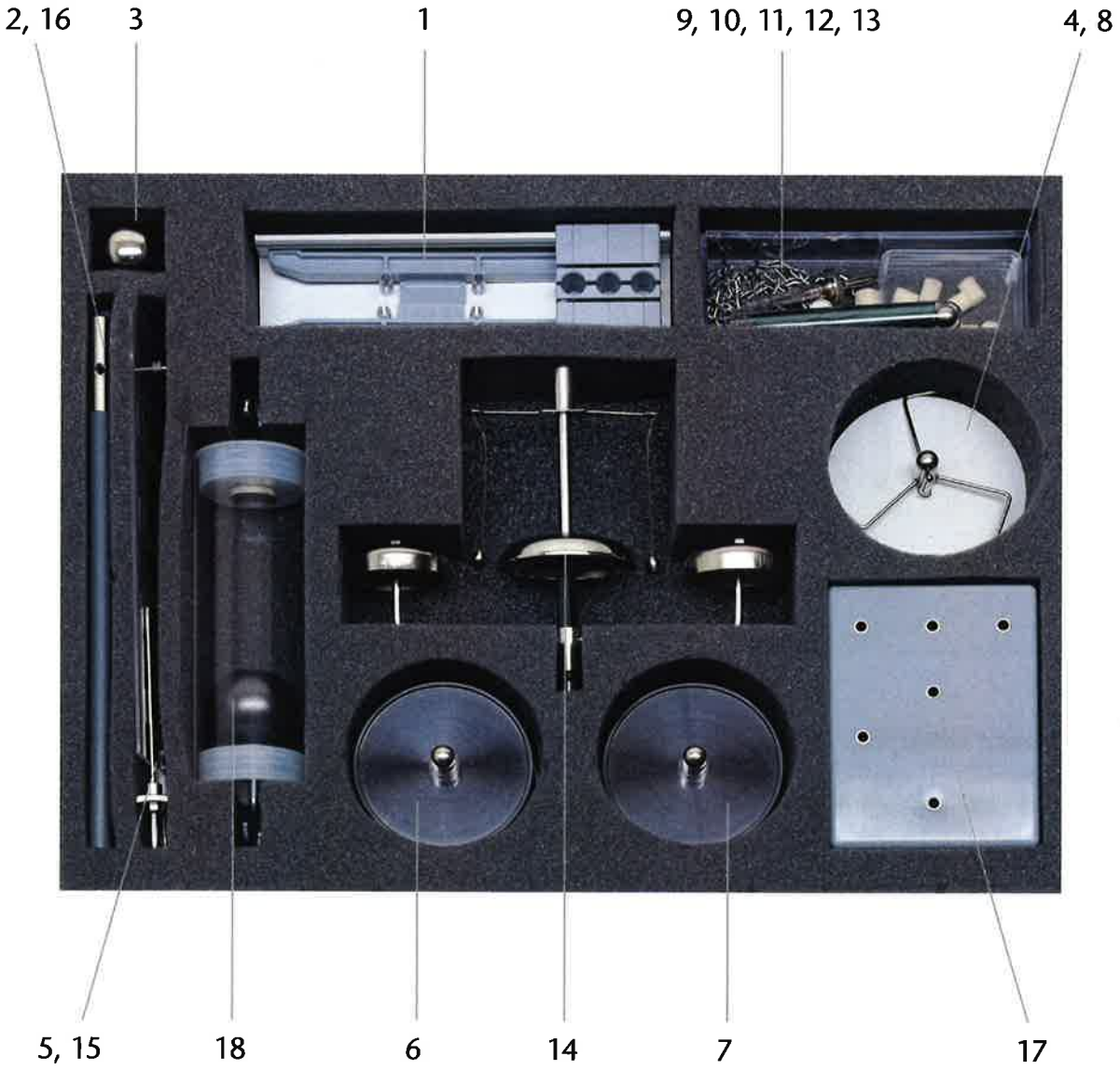


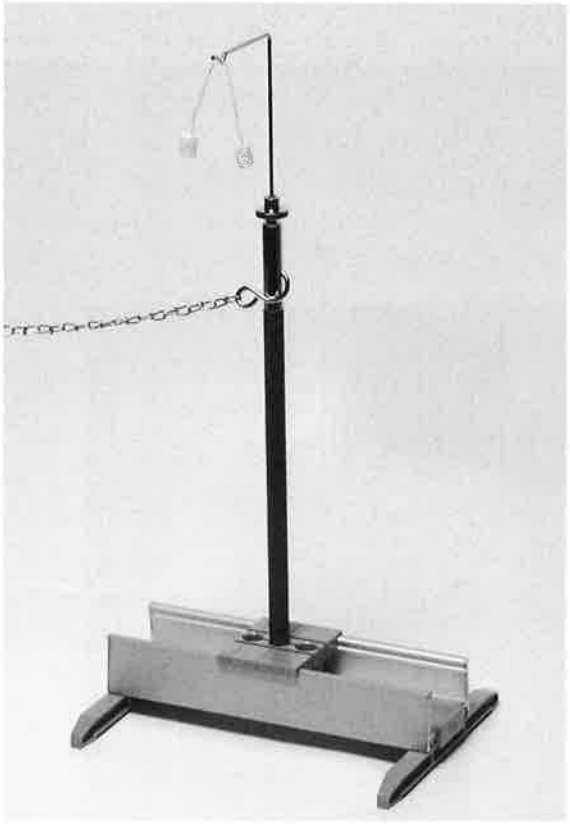
Fig. No.	Qty.	Description	Order No.
1		Stand base, *consisting of:*	
	1	Rail profile	40813
	1	Pair of feet for rails	40861
	1	Clamp slider	40820
2	1	Insolating rod	40598
3	1	Sphere (ball) with plug	50120
4	1	Base plate with plug	50323
5	1	Hook stand with plug	23114
6	1	Case with sphere electrode	50321
7	1	Case with point electrode	50322
8	1	Electric whirl	50335
9	1	Needle bearing with plug	50336
10	1	Pith cylinder pendulum	23134
11		Pieces of pith (10 each)	50371
12	1	Tissue paper umbrella	50333
13	1	Pair of metal chains	50326
14	1	Carillon	50325
15	1	Lightning board	50320
16	1	Friction rod with bore hole	40599
17	1	Storage stand	50324
18	1	Electrostatic ball-run	50178
–	1	Tube with silicone grease (no. fig)	408619

Storing plan



Electrostatics

1 Force action between two charged bodies



Material:

Stand base	1
Insolating rod	2
Sphere (ball) with plug	3
Hook stand with plug	5
Pith cylinder pendulum	10
Chain	13
Friction rod with bore hole	16

Additionally required:

Wimshurst (electrostatic) machine

Experiment set-up:

The stand base is assembled from the rail profile, the feet and the clamp slider. The insolating rod is plugged into the clamp slider. The hook stand is mounted into the axial bore hole (A) of the insolating rod. The pith cylinder pendulum is hung onto the stirrup of the hook stand. The lateral socket (B) of the insolating rod is connected to one pole of the charge source via a chain or a connecting lead.

Carrying out the experiment:

A charge is generated which is transferred to the cylinder pendulum. Because the pith pieces are evenly charged, they mutually repulse each other.
Instead of having a direct connection to the charge source, the charge can also be transferred to the hook stand with the aid of a charge spoon (friction rod with sphere).
The cylinder pendulum constitutes a simple electroscope.

2 Brush electroscope

Material:

Stand base	1
Insolating rod	2
Sphere (ball) with plug	3
Tissue paper umbrella	12
Chain	13
Friction rod with bore hole	16

Additionally required:

Wimshurst (electrostatic) machine

Experiment set-up:

The stand base is assembled from the rail profile, the feet and the clamp slider. The insolating rod is plugged into the clamp slider. The rod of the tissue paper umbrella is plugged into the axial bore hole (A) of the insolating rod.
The lateral socket (B) of the insolating rod is connected to one pole of the charge source via a chain or a connecting lead.

Carrying out the experiment:

Slowly increase the charge you are supplying. The paper strips of the umbrella are charged up evenly. They mutually repulse each other, thus sticking out evenly on all sides.
Due to the fact that this phenomena is charge dependent, the paper umbrella can also be regarded as a simple electroscope.
Instead of having a direct connection to the charge source, the charge can also be transferred to the hook stand with the aid of a charge spoon (friction rod with sphere).

3 Peak discharge

Material:

Stand base	1
Insolating rod	2
Electric whirl	8
Needle bearing with plug	9
Chain	13

Additionally required:

Wimshurst (electrostatic) machine

Experiment set-up:

The stand base is assembled from the rail profile, the feet and the clamp slider. The insolating rod is plugged into the clamp slider. The needle bearing is plugged into the axial bore hole (A) of the insolating rod. The electric whirl is carefully positioned onto the needle.
The lateral socket (B) of the insolating rod is connected to one pole of the charge source via a chain or a connecting lead.

Carrying out the experiment:

The electric charge generated is transferred to the electric whirl. As the charge flows out of the tips very rapidly, there is a recoil action. The rotating speed accelerates as the supplied charge increases, the tips of the whirl acting like discharge nozzles for gases or liquids.

4 Electric dance

Material:

Stand base	1
Insolating rod	2
Base plate with plug	4
Case with sphere electrode	6
Pieces of pith	11
Chains	13

Additionally required:

Wimshurst (electrostatic) machine

Experiment set-up:

The stand base is assembled from the rail profile, the feet and the clamp slider. The insolating rod is plugged into the clamp slider. The base plate is attached into the axial bore hole (A) of the insolating rod.
A couple of pith pieces are poured into the plastic housing containing the sphere electrode. The container is turned on its side with the open side downwards on the base plate.
The lateral socket (B) of the insolating rod and the socket on the sphere electrode are connected to the charge source with chains or connecting leads.

Carrying out the experiment:

The charge is slowly increased until the pith pieces in the container begin "dancing". Then the charge supply is interrupted and the process observed for a while.
The pith pieces lying on the base plate are evenly charged and repulsed from the base plate. In the proximity of the reverse pole, the charge is released again and they acquire the opposite charge. Then they fall back to the base plate and the process starts anew. Even after the charge flow is interrupted, there is still sufficient stored charge left over for the induced electric dance to be observed.

5 Electrostatic filter (smoke consumer)

Material:

Stand base	1
Insolating rod	2
Base plate with plug	4
Case with point electrode	7
Chains	13

Additionally required:

Wimshurst (electrostatic) machine

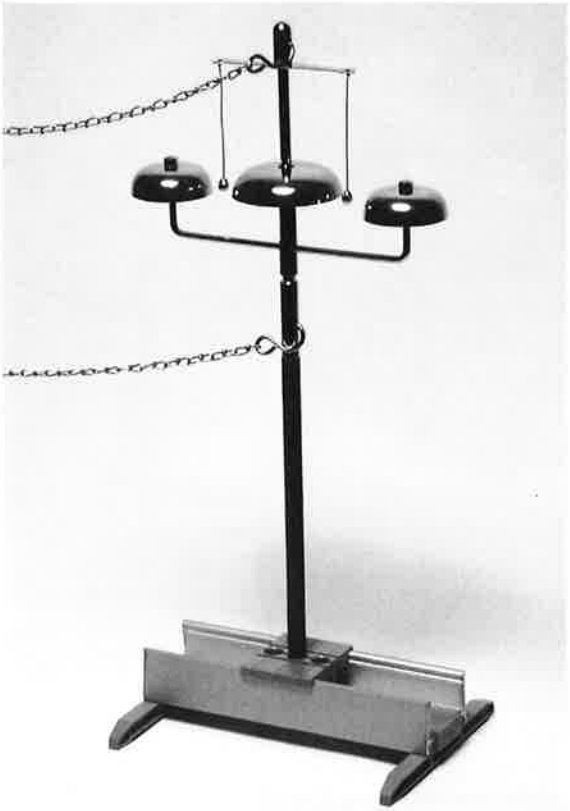
Experiment set-up:

The stand base is assembled from the rail profile, the feet and the clamp slider. The insolating rod is plugged into the clamp slider. The base plate is plugged into the axial bore hole (A) of the insolating rod.
The plastic casing with the point electrode is filled with smoke (by blowing out a candle, smoke candle). The container is turned on its side with the open side downwards on the base plate.
The lateral socket (B) of the insolating rod and the socket at the point electrode are connected to the charge source using the chains or connecting leads.

Carrying out the experiment:

The charge is slowly increased until the precipitation of the smoke can be clearly observed. The procedure should then be repeated once again. The point electrode sprays charge carriers of one polarity into the area. This results in the smoke particles also becoming charged with this polarity, so that they repel one another and are precipitated on to the oppositely charged base plate.

6 Electric chimes



Material:

Stand base	1
Insolating rod	2
Chains	13
Carillon	14

Additionally required:

Wimshurst (electrostatic) machine

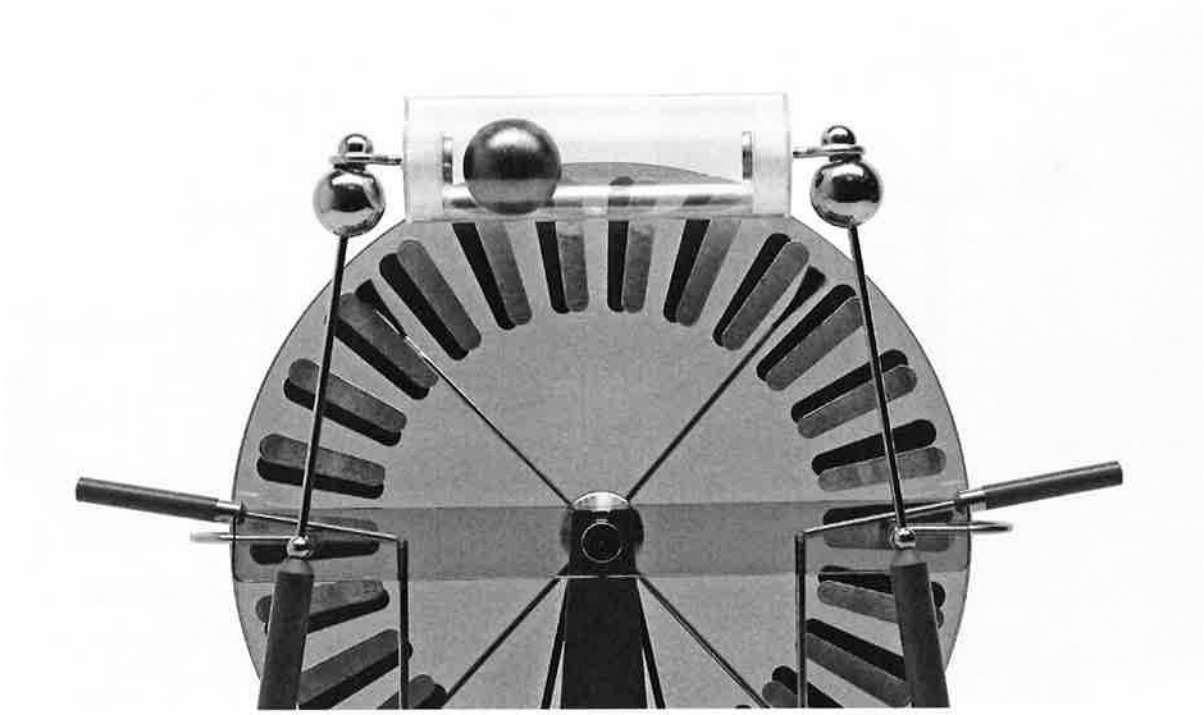
Experiment set-up:

The stand base is assembled from the rail profile, the feet and the clamp slider. The insolating rod is plugged into the clamp slider. The carillon is attached into the axial bore hole (A) of the insolating rod.
The lateral socket (B) of the insolating rod and the socket of the carillon are connected to the charge source using chains or connecting leads.

Carrying out the experiment:

The charge flow is slowly increased until the metal clappers between the chimes begin to swing and bang against them. Excessive charges lead to flashovers between the mounts.
The clappers charge up electrostatically and are attracted to the outer chimes with the opposite charge or repulsed by the middle chime. When contact is made with the outer chimes there is a discharge and the clapper swings back in the other direction. The process begins anew with the opposite charging.

7 Electrostatic ball-run connected to an influence machine



Material:		Additionally required:
Electrostatic ball-run	18	Wimshurst (electrostatic) machine

Experiment set-up:

The influence machine is discharged by short-circuiting its two electrode rods. The spheres on the two electrode rods are then positioned at a distance of about 20 cm from one another such that the electrostatic ball-run can be suspended by its hooks between the spheres as illustrated. The ball-run should be aligned as horizontally as possible by making fine adjustments to the electrode rods.

Carrying out the experiment:

Charge is supplied to the two electrode plates of the ball-run by turning the drive crank of the influence machine. As a consequence of this, the ball, with its electrically conductive surface, also takes on a charge, either as a result of electrostatic influence or through direct contact with an electrode.
As soon as the charge taken up and stored by the ball is large enough, the ball is repelled by the electrode with the same polarity and attracted by the electrode with the opposite polarity. It then rolls towards the attracting electrode. As soon as it touches this electrode, it gives up its stored charge and becomes charged in accordance with the polarity of this electrode. This then causes it to be repelled from this electrode and roll towards the other electrode. A situation thus arises in which the ball moves constantly back and forth, so long as charge continues to be supplied to the electrode plates by the influence machine.

8 Electrostatic ball-run connected to a stand mount

Material:

Electrostatic ball-run 18

Additionally required:

Insulating rod, 2x
E. g. from Cornelsen Experimenta, Order No. 51256

Barrel base, 2x
E. g. from Cornelsen Experimenta, Order No. 40040

Experiment lead, 50 cm, black, 2x
E. g. from Cornelsen Experimenta, Order No. 51617

High-impedance high-voltage source (Van de Graaff generator)

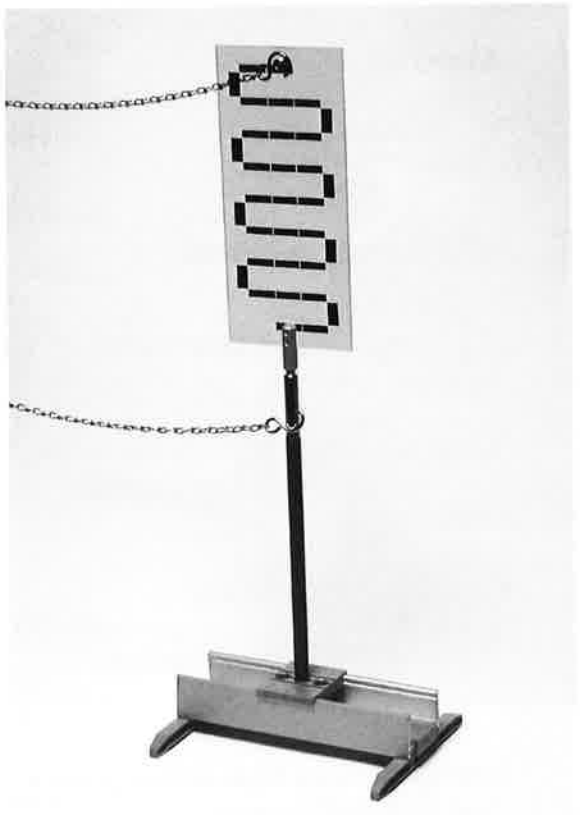
Experiment set-up:

The insulating rods are attached to the barrel bases; they are then placed at a distance of about 20 cm from one another such that the electrostatic ball-run can be suspended by its hooks above the experiment leads, which are plugged in from the side, as illustrated. The ball-run should be aligned as horizontally as possible by making fine adjustments to the insulating rods in the barrel bases.

Carrying out the experiment:

The experiment leads are connected to the terminals of a high-impedance high-voltage source. Once the high-voltage source has been switched on, charge is supplied to the two electrode plates of the ball-run. As a consequence of this, the ball, with its electrically conductive surface, also takes on a charge, either as a result of electrostatic influence or through direct contact with an electrode.
As soon as the charge taken up and stored by the ball is large enough, the ball is repelled by the electrode with the same polarity and attracted by the electrode with the opposite polarity. It then rolls towards the attracting electrode. As soon as it touches this electrode, it gives up its stored charge and becomes charged in accordance with the polarity of this electrode. This then causes it to be repelled from this electrode and roll towards the other electrode. A situation thus arises in which the ball moves constantly back and forth, so long as charge continues to be supplied to the electrode plates by the high-voltage source.

9 Lightning board



Material:

Stand base	1
Insolating rod	2
Chains	13
Lightning board	15

Additionally required:

Wimshurst (electrostatic) machine

Experiment set-up:

The stand base is assembled from the rail profile, the feet and the clamp slider. The insolating rod is plugged into the clamp slider. The lightning board is plugged into the axial bore hole (A) of the insolating rod.
The lateral socket (B) of the insolating rod and the socket at the top of the lightning board are connected to the charge source using chains or connecting leads.

Carrying out the experiment:

The charges generated by the charge source are applied to the end contacts of the lightning board. When the voltage is high enough, a flash discharge occurs across the gaps in the conductor runs.