Breukhoven b.v.
Postbus 835
2900 AV Capelle a/d IJssel
Nederland
tel: +31(0)10 - 458 42 22
fax: +31(0)10 - 450 82 51
website: www.breukhoven.nl

Manual
Wimshurst Machine

The abbreviations in the text refer to the exploded drawing. Since this drawing is the original one and a complete schedule of the machine, not all numbers are of importance to this manual. There are two drawings, a rear view one and a side view one.
The capitals behind the letters refer to the position in the drawing.(e.g. 33R is position 33 to be found in drawing 1, which shows REAR).
LR, RR, LF and RF are too be found in drawing 1 and are short for Left-Rear, Right-Rear, Left-Front and Right-Front. (last two are not visible in that drawing).
The other abbreviations refer to drawing 2: L=left, R=right, LT=left-top, LB=left-bottom, RT=right-top, RB=right-bottom

Description

Two acrylic discs, 02L and 02R, placed in parallel position on an axis (19), are connected by belts (54L & 54R) to a driving shaft (18).
This shaft is driven by a hand crank (41). By turning the hand crank the two discs will rotate in opposite direction.
On the outer side, the discs are lined with tin foil patches (64), which are placed circular in an even pattern.
The end of two rods (24L & 24R), placed in front of the discs on the outer side, hold copper brushes (58LT & 58LB, 58RT & 58RB) .
The copper brushes are making contact with the tin foil patches when the discs are revolving.
The discs are revolving also through two U-shaped metal bars (23L & 23R). These U-shaped bars carry, on each side of the outer disc, copper brushes (23LR & LF, 23RR &RF). These brushes are placed a few millimetres away from the discs.
The U-shaped bars are in connection with electrode rods (08LR & 08RR). By means of levers (31LR & RR), placed between the electrode rods and the U-shaped metal bars, the Leyden jars (55LR & RR) can be charged.
Lever (34R), at the back of the stand, connects the Leyden jars. In opened situation the contacts provide alternating current. When the lever is connecting both contacts (33R & 35R), and therefore short circuiting the Leyden jars, direct current can be obtained.
The maximum distance between the two electrode rods, that still will produce a spark, can be approximately 120 mm. This strongly depends on the humidity of the surrounding area.

Principle

By taking the Wimshurst machine in operation, the induction process is started. This induction process will increase the charge on the tin foil patches until the operating voltage has been reached. Operating voltage is limited by defaults in insulation, the convey of current and the spark transfer.
For example: The tin foil patches, (64), on disc 02L are positively charged in comparison to copper brush 58RT, therefore the opposite tin foil patches, (64 on 02R), will have a negative charge. At the same time, through copper brushes 58RT and 58RB, an equal positive charge is

transmitted towards tin foil patches on opposite disc (64 on 02R). It causes also a corresponding negative charge on tin foil patches on disc 02L.
If now disc 02L, with the negative charges on tin foil patches (64), is positioned opposite copper brush 58RT, it will causes a positive charge in tin foil patches (64) on 02R. A corresponding negative charge is being conduced towards the tin foil patches opposite disc 02R through copper brushes 58 LB & LT. It will cause a positive charge in the opposite tin foil patches (64) on 02L.
Next logical step is to monitor what happens when disc 02R is revolving. This will bring the positively charged tin foil patches (64) on 02R underneath copper brush 58RT into opposite position of copper brush 58LT.
In reality these processes take place at the same time. The charges on disc 02L, will induce positive or negative charges on disc 02R underneath copper brushes 58RT & RB. These charges will pass opposite brushes 58LT & LB and, by induction, charge tin foil patches (64) on disc 02L. Of course this can be positive or negative charges.
This is an ongoing process until the charges are lead away from disc 02R by the copper brushes which are held by the U-shaped metal bars (23L & 23R).
The same process occurs on disc 02L.

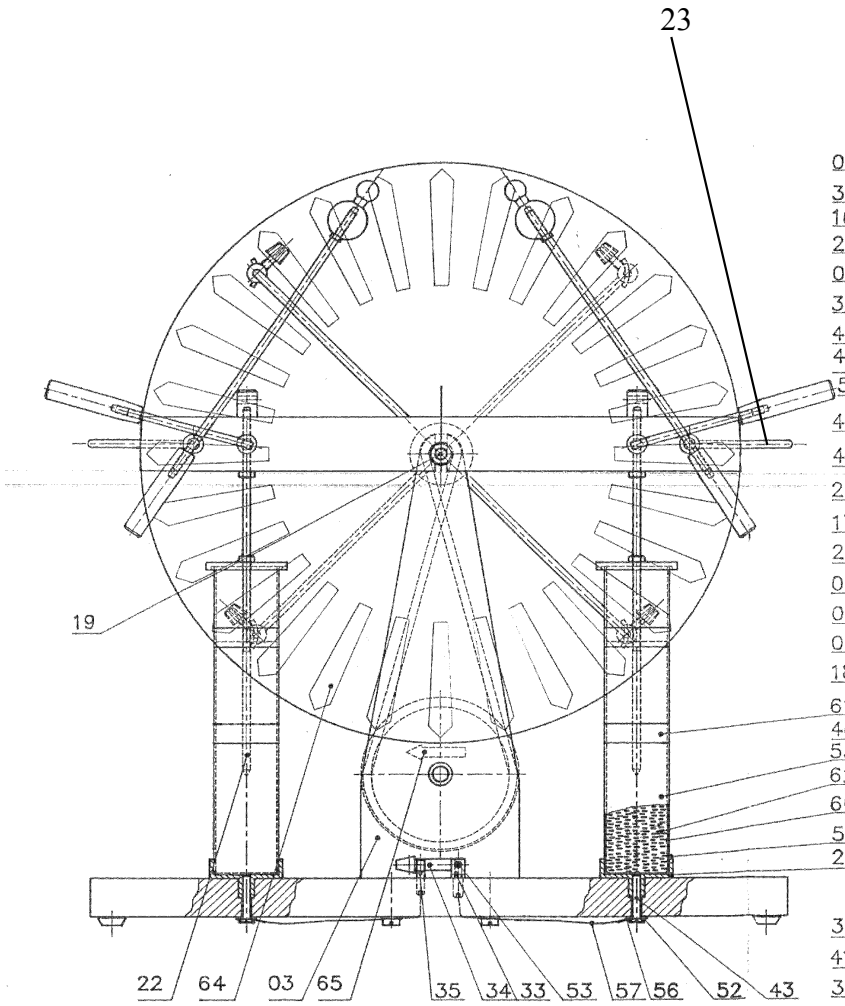
Before use

The Wimshurst machine is ready for use after the hand crank (41) is connected to the driving shaft (18). Make sure the diagonal placed rods (24L & 24R), are positioned in a way they form an "X". By putting the Leyden jars (55LR & RR) in the circuit, the spark carries an increased amount of energy. This will affect the energy discharge but not the length the spark can carry between the electrodes 08LR & 08RR.
To generate AC through contacts 33R & 35R, the electrode rods 08LR & 08RR should be placed very close to each other, so only small spark can be transferred.

Trouble shooting

-If the copper brushes 58LT & 58LB, 58RT & 58RB on rods 24L & 24R are worn out, a piece of the ends should be cut of. The brushes should be placed back in a way so they touch the two discs 02L and 02R, and make contact with the tin foil patches (64).
-The copper brushes 23LR & LF, 23RR &RF of the U-shaped bars should not touch the discs.
-Keep the machine dust free. Dust has a negative influence on the insulation and it may cause malfunctioning. If this occurs the machine should be made dust free. It also helps to blow hot air on the Wimshurt machine, 10 minutes before using it.
-Make sure the belts (54L & 54R) are placed in the appropriate way. Belt 54L should be placed in a straight forward way, belt 54 R is placed in a helix way. This makes sure the discs 02L and 02R do revolve in an opposite way.
-The Leyden jars (55LR & RR) should be free from damage or cracks. Otherwise it will affect the amount of energy carried by the sparks.
-A Whimshurst in operation, will produce a specific smell. The spark causes a chemical reaction. The oxygen in the air is transformed into ozone.
-After use of the Wimshurst machine it is recommendable to make sure all the electrical energy is lead out. For a complete discharge, the two electrode rods 08LR & 08RR should make full contact and stay in contact for a few seconds.

Drawing 1



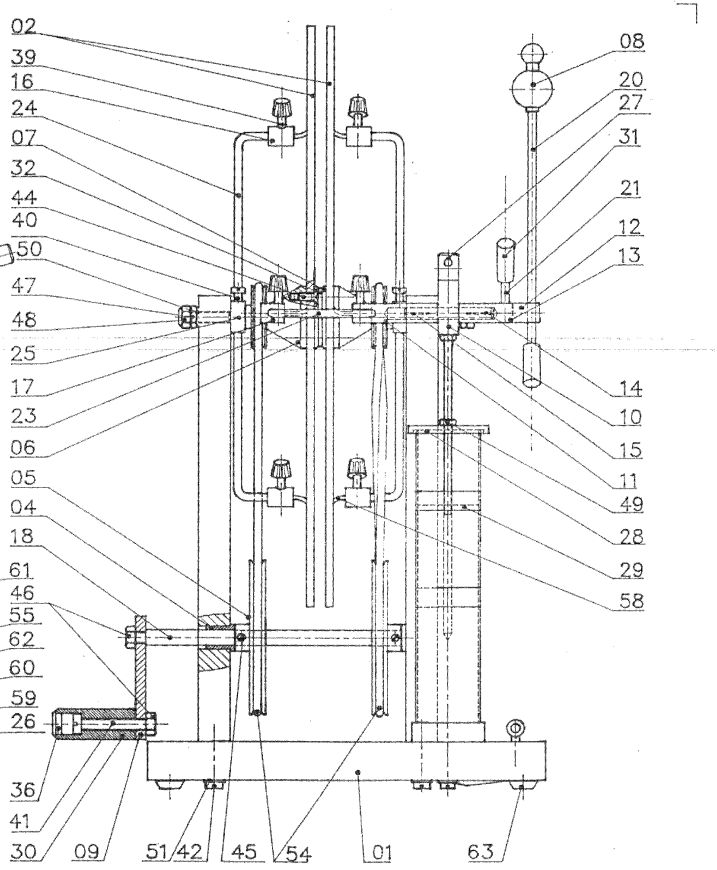
LEFT **RIGHT**

REAR

Drawing 2

TOP

LEFT **RIGHT**



LEFT **RIGHT**

BOTTOM