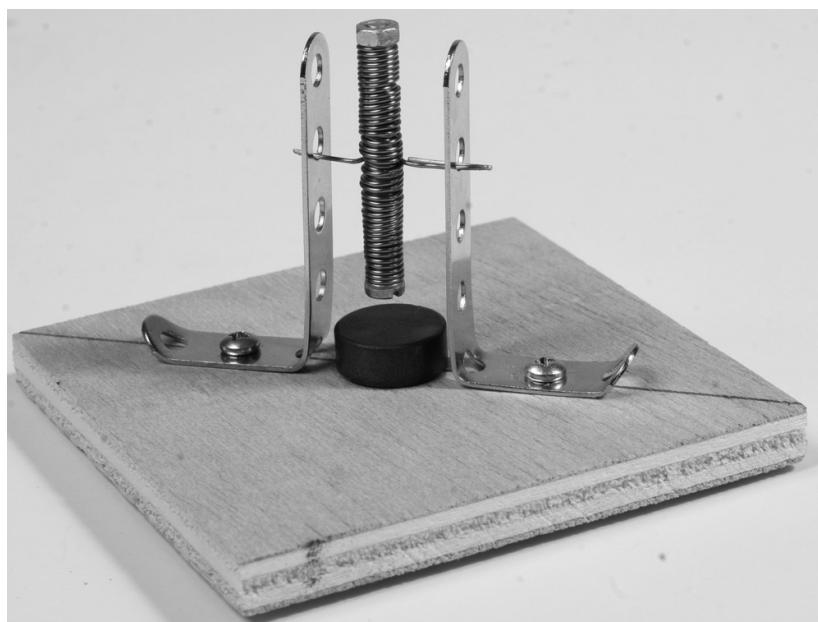


# OPITEC

# Hobbyfix

107.399

*Working model  
of an Electric motor*



Material	Quantiy	Size(mm)	Description	Part no
Plywood	1	8x80x80	Grundplatte	1
Magnet	1	Ø15x6 mm		2
Flat metal strip	2	10x70	Lagerbock	3
Screws	2	2,9x9,5	Befestigung	4
Machine screw	1	M3x35	Eisenkern	5
Nut	1	M3	Eisenkern	6
Varnished copper wire		0,6	Spule	7

#### Necessary tools

Pencil, ruler  
Metal glue  
Sellotape  
Side cutters, screwdriver  
Pliers  
Emery paper

#### Please Note

The OPITEC range of projects is not intended as play toys for young children. They are teaching aids for young people learning the skills of Craft, Design and Technology. These projects should only be undertaken and tested with the guidance of a fully qualified adult. The finished projects are not suitable to give to children under 3 years old. Some parts can be swallowed. Danger of suffocation!

# Safety notes for working with magnets



Permanent magnets and magnetic article are technical products that require safety knowledge. All persons experimenting or working with magnets should read these note and keep them in mind!



## Articles that can be influenced by magnets

- Computers or electronic data
- Electronic machines
- Heart pacemakers
- Injuries caused by crushing or pinching
- Danger caused by magnetic splitters
- Danger of fire and explosion
- Health dangers caused by contact with drinking water, food or skin



## Working with magnets

- People with heart pacemakers should avoid contact with all types of magnetic fields
- Computers and other data storage units should be kept away from magnetic fields
- Magnets must be carefully handled in the presence of other magnets and objects made from iron. There is a danger of injury caused by pinching or squashing-wear safety protection
- Magnets must not be used in an atmosphere where there is a danger of explosion
- Items made from iron should not be left near magnets
- Strong magnets can splitter when under attraction , to avoid injury when working with magnets wear safety glasses
- When working with magnetic properties in mechanical projects there is a danger of fire
- Glowing or burning magnets should not be extinguished with water, Co2 or halogen – use sand or powder extinguisher
- The presence of hydrogen can cause magnets to deteriorate and lead to them breaking up- avoid all contact between magnets and hydrogen
- Some magnets have a nickel coating which can cause skin allergy- handle – if this happens avoid all contact



## Be careful with magnetism

- Be careful of magnetic fields, magnets can spring apart and cause accidents
- Fix magnets in a holder and never hold them freely in your hands
- Magnets can shatter
- Keep your working area free from magnetic pieces
- Read any special makers instructions that come with the magnets



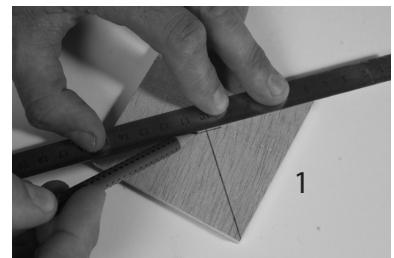
## Transport

- When transporting magnets by air there are special regulations that must be followed
- This also applies to appliances with built in magnets- contact airline
- There are also regulations for sending magnetic goods by post – see Post Office

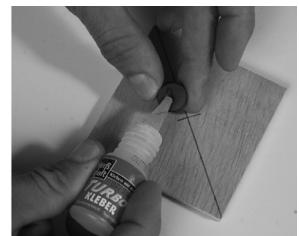


# Instructions

1. Mark out a set of diagonal line on the plywood base (1)

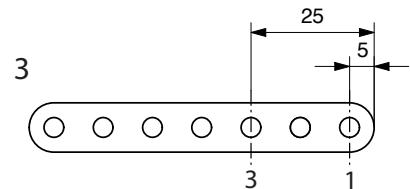


2. Glue the magnet block in the middle



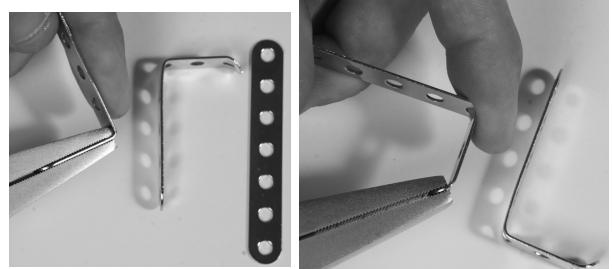
3. Mark a line in the middle of hole 3 in both of the metal strips

Bend the strip at right angles using a pair of pliers.  
Then bend up the ends by the first hole at 45 degrees



**Note:**

It is important that this stage is accurate  
so that the motor will function properly



4. Mount the metal strips (3) on the base, using the screws (4)  
They must be 2mm away from the magnet



5. Screw the nut (6) on the machine screw making sure that it is level with the end (5)  
Glue the nut in position ( 2 component glue or similar )

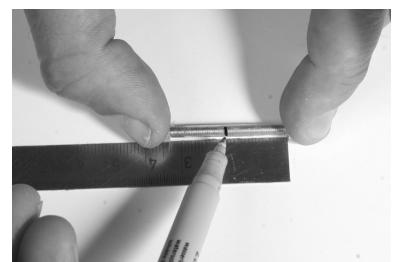


# Instructions

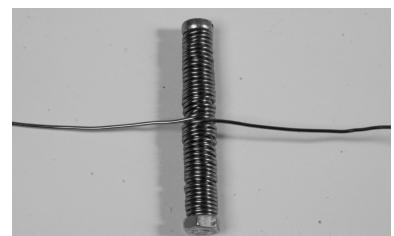
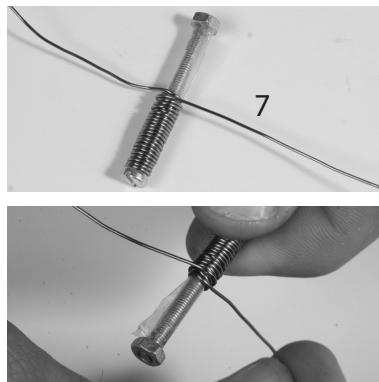
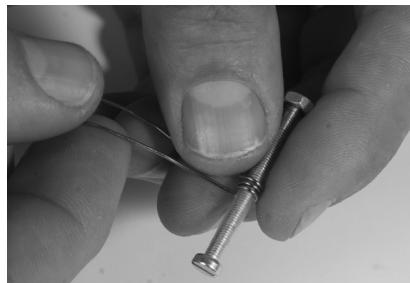
6. Now wrap a layer of sellotape carefully around the machine screw. This is so that the varnish insulation on the copper wire is not damaged..



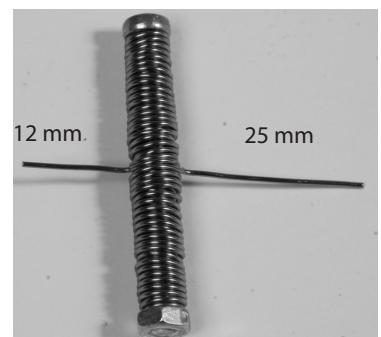
7. Mark the middle of the threaded part.



8. Unwind the coil of copper wire and cut off a length 1200mm long  
 The bend the wire in the middle into a "u"shape  
 Lay the middle of the wire on the mark on the screw .The wind the wire around the machine screw up the top and back down with a second layer to the middle. Leave the remainder of the wire sticking out to one side.  
 Now turn the machine screw over and wind the second half in the same direction



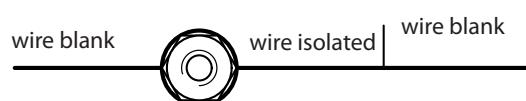
9. Now make sure the pieces remaining in the middle stand at 90 degrees to the machine screw. This will be used as the axis. Cut off one side of the wire to 12mm long and the other to 25mm



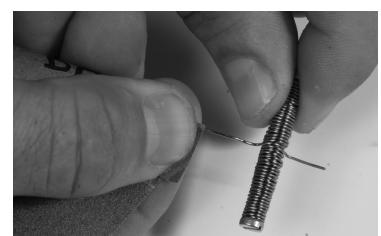
10. Use emery cloth to remove 10mm of the varnish insulation from each end of the wires

**Note :**

make sure that only 10mm insulation is removed and the rest of the wire is not damaged

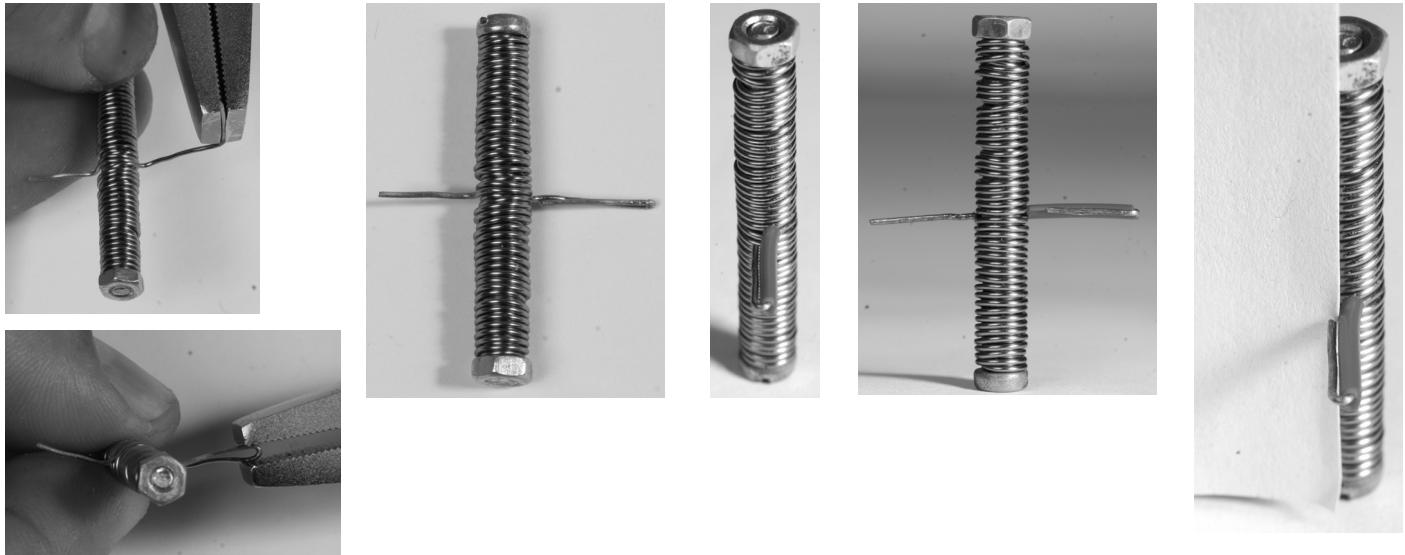


A further construction possibility is when an insulated plastic casing from electrical wire forming a tube, as insulation is slid over the ends up to the coil



# Instructions

11. Make sure the wire run parallel to each other at 180 degrees  
Important the motor can only turn when the collector is at right angles



12. Mount the coil between the metal holder so that is parallel to the metal stand

13. Testing the motor

Connect a 4.5 volt battery and give the coil a tap. The motor should run

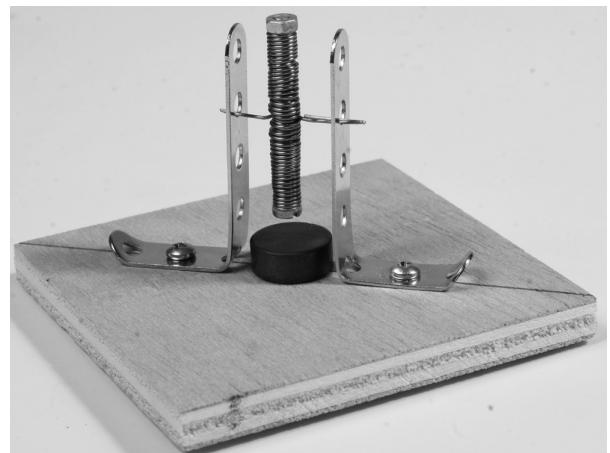
If the motor does not turn:

Check that the coil ends are really clean ( varnish removed)

You have not insulated the machine screw

You have a short circuit in the coil

The core is not in the middle of the stand.



## Following points can be tried

1. A coil with a current flowing through it becomes magnetic  
This means one end has a north pole and the other a south pole  
Our coil can easily pick up paper clips etc. Disconnect the battery and the paper clip falls down
2. When you place the coil in a stand with a permanent magnet underneath the coil will be pulled and repelled. The distance between the magnet and the coil should be at least 5mm  
To adjust this bend the wire axis of the coil a little down or up
3. A insulation must switch off the current in the correct moment, so that the coil can keep turning and does not block itself  
If coil needs a helping hand / tap with a finger to get it in the correct start position  
So that it can turn by itself  
When the motor is running properly it only needs about 0.3 volts

## Note

This turning movement can only work when the collector (with insulation tape or a plastic sleeve) is insulated and the coil is at right angles to the stand