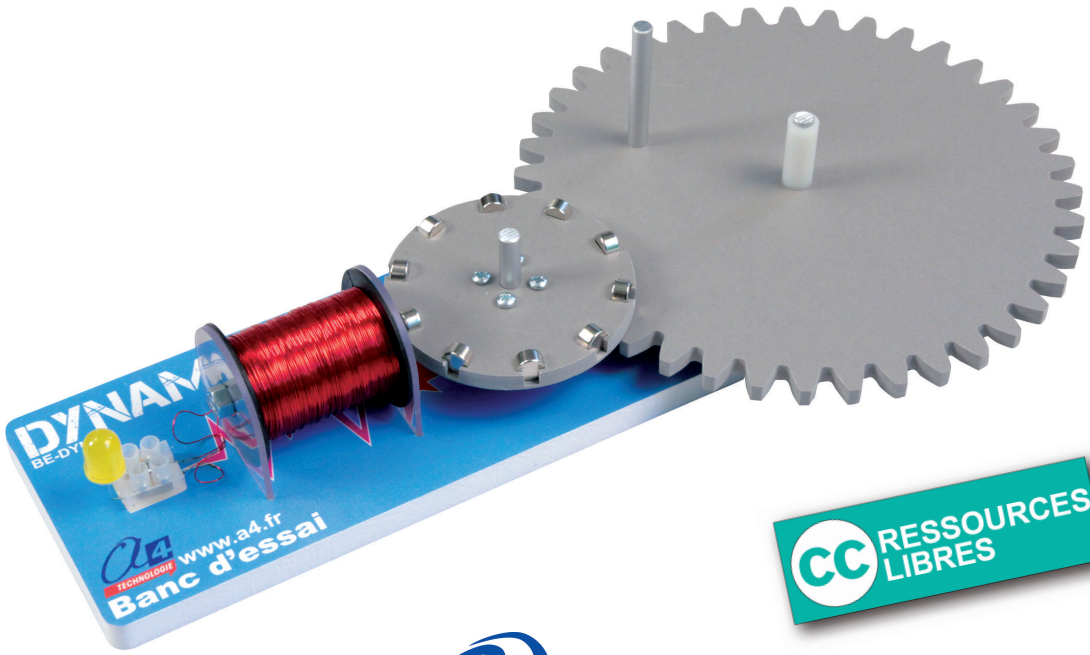
2017

Test stand

# Dynamo






A4 TECHNOLOGIE

# Test stand dynamo

2017

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## SUMMARY



## RESOURCES

All resources of this project are available on our website www.a4.fr and on the CD (ref “CD-BE1”).

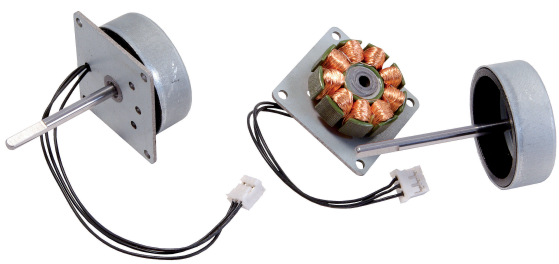
- The FreeHand version file (editable with this software - Evaluation version included).
- The PDF version file (readable and printable with AcrobatReader software).
- CharlyGraal format machining files.
- The full 3D **modeling** on SolidWorks, Parasolid and eDrawings format.

## Related products (See A4 catalogue)

Allow to study the electricity production principle.

Crank generator (réf. MOTO-GENE-B)

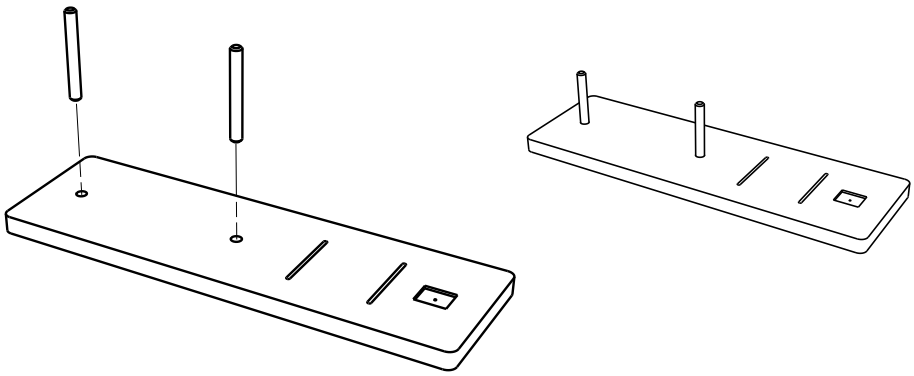
Mini-generator (réf. MOT-GENE-C)



# **Presentation -** Preparation of the model in kit delivered 1/2

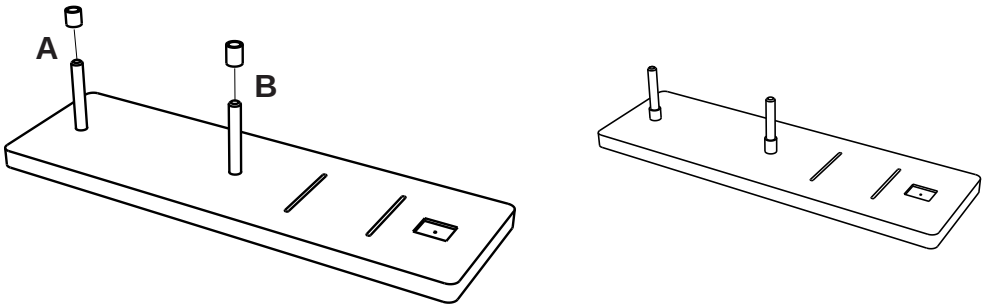
## 1 - Mounting axles on the plate

Fit and stick the two axles
in the two Ø 6 plate holes.



## 2 - Mounting spacers on axles

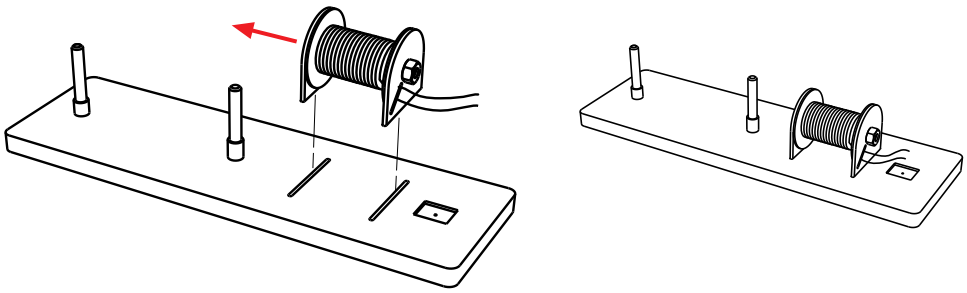
Fit and stick the 8 mm high spacer on (A) axle,
fit and stick the 10 mm high spacer on (B) axle.




## 3 - Mounting the coil on the plate

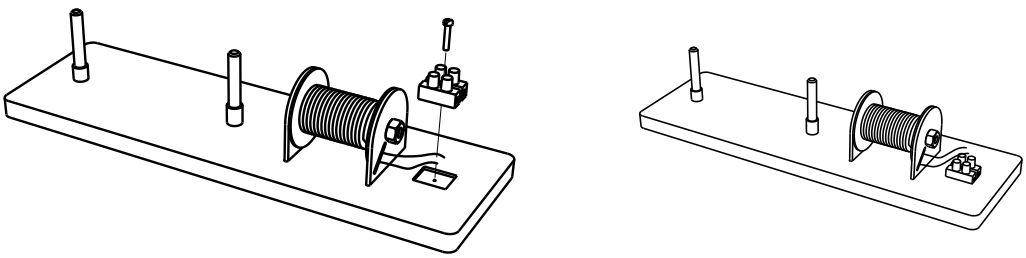
Fit and stick the two plate flanges
into plate grooves.

**Be careful about the mounting direction
(coil screw head on rotor side).**



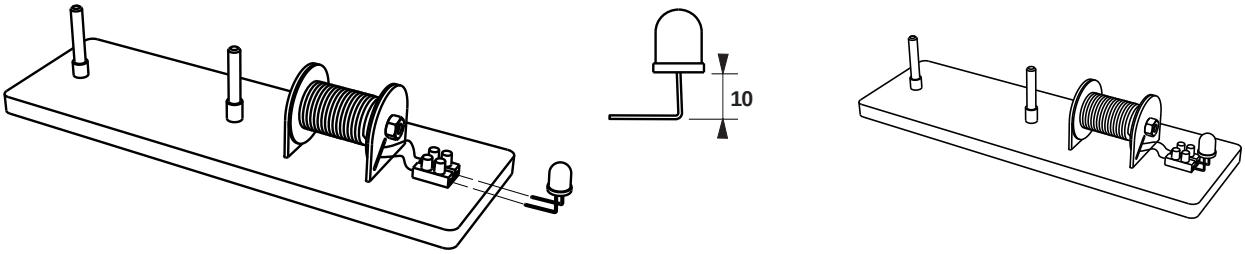
## 4 - Mounting the terminal

Put the terminal into its cavity and maintain it with the 2 x 13 screw.



## 5 - Coil wiring / terminal / LED

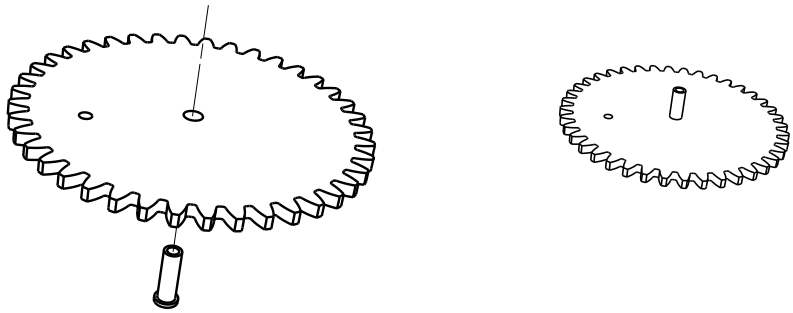
Bend the two LED pins and connect them in the terminal as indicated on the drawing below.



# **Presentation -** Preparation of the model in kit delivered 2/2

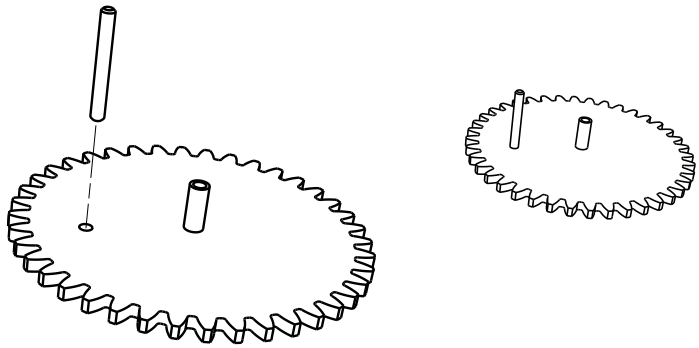
## 6 - Mounting the axle-bearing on the 40 cogs large cogwheel

Fit and stick the barrel into the Ø 9 cogwheel central hole.



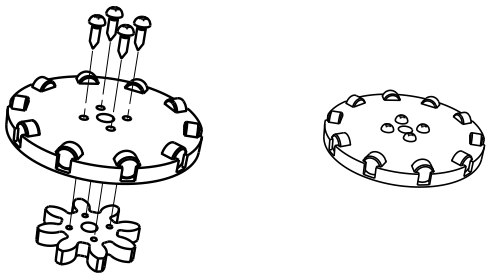
## 7 - Mounting the crank on the 40 cogs large cogwheel

Fit and stick the crank
into the Ø 6 cogwheel hole.



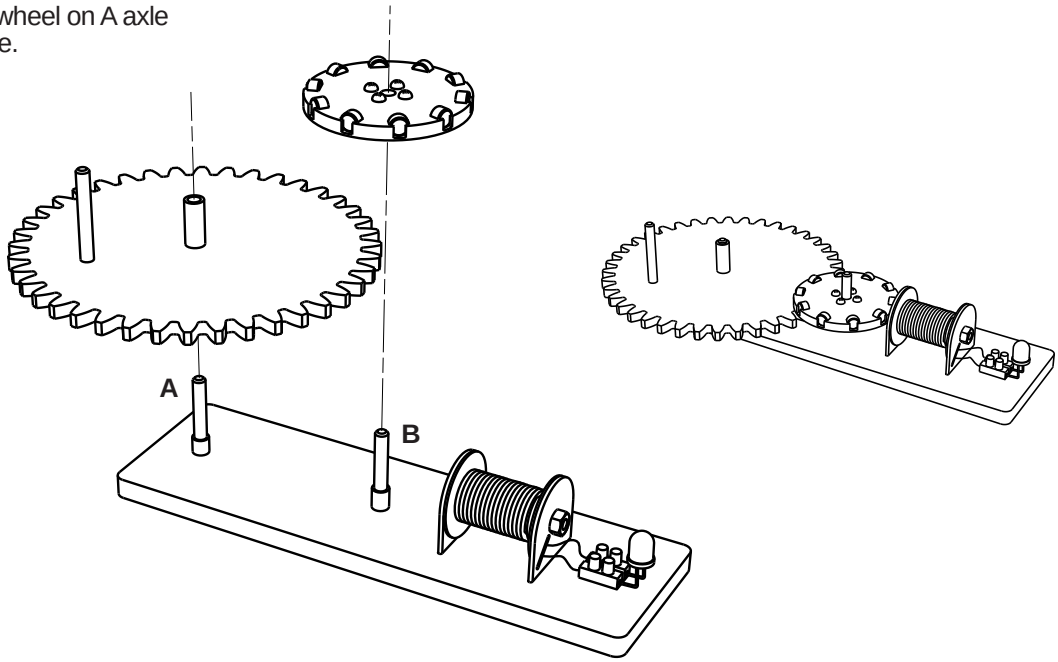
## 8 - Mounting the 8 cogs cogwheel on the rotor

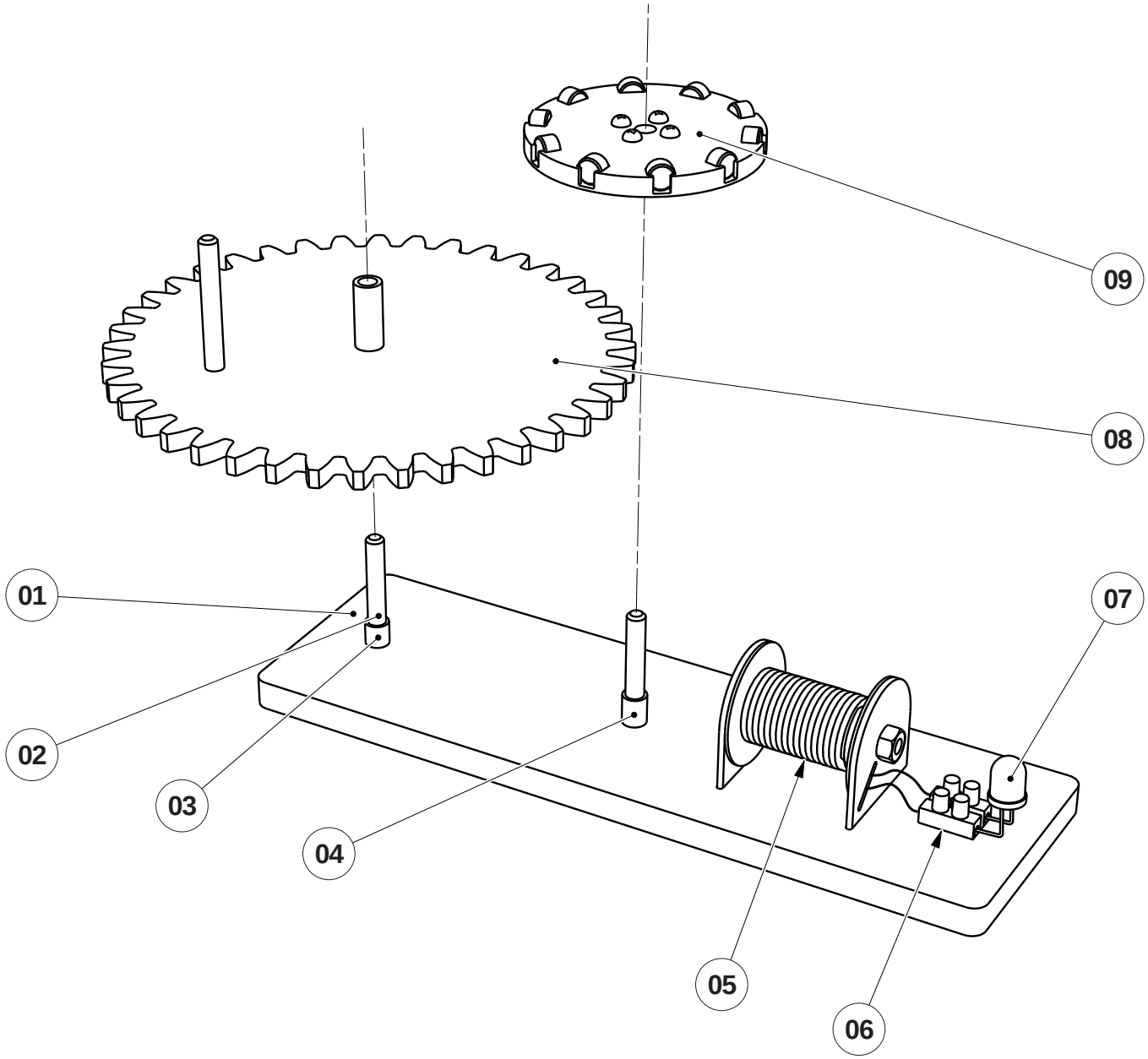
Maintain the cogwheel with the 4
3 x 9,5 cylindrical head screws .



## 9 - Mounting assemblies (cogwheel / rotor) on the test stand

Fit and stick first the cogwheel on A axle
then fit the rotor on B axle.






| MARK | NUMBER | FUNCTIONS | CHARACTERISTICS |
|---|---|---|---|
| **09** | 01 | Rotor | Expanded PVC - Equipped with 10 magnets - 8 cogs cogwheel |
| **08** | 01 | 40 cogs cogwheel | (with crank and axle-bearing) Ø 168 mm external expanded PVC |
| **07** | 01 | LED | Ø 10 mm yellow |
| **06** | 01 | Terminal | 2 terminals |
| **05** | 01 | Coil | 100 m enamelled copper wire Ø 0.315 mm |
| **04** | 01 | Spacer | Ø 6 mm int x Ø 10 mm ext x 10 mm high nylon |
| **03** | 01 | Spacer | Ø 6 mm int x Ø 8 mm ext x 8 mm high nylon |
| **02** | 02 | Axle | Alu Ø 6 mm |
| **01** | 01 | Plate | 256 x 80 x 10 mm thickness expandes PVC |

TECHNOLOGIE

A4

School Class

Name Date

PROJECT
**TEST STAND Dynamo**

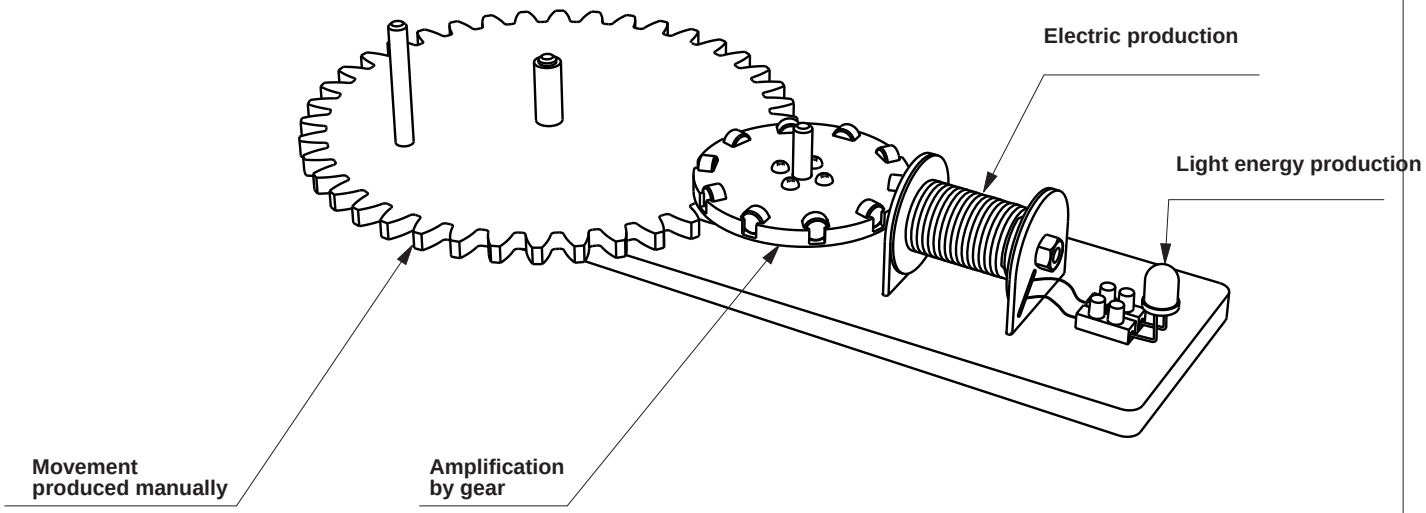
PART
**Assembly**

DOCUMENT TITLE
**Perspective assembly drawing**

# Educational operation 1/2

This model is designed to test electrical production by varying a magnetic field into a solenoid.

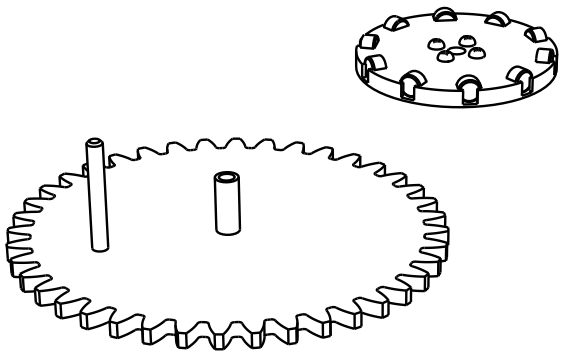
It allows to visualize an energy transformation:
1 - Movement produced manually (muscle energy).
2 - Movement amplification with gear (5 factor with 40 and 8 cogs cogwheels).
3 - Electrical production through a solenoid.
4 - Light energy production in a LED.

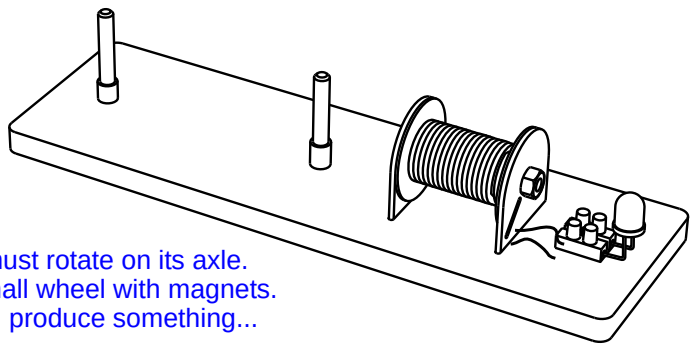



## Some educational suggestion

### 1 - Discovery, observation and dynamo test stand take in hand

Rather than assigning the test stand ready to use to a group of students, let them discover the disassembled parts and ask them to describe object and imagine what it can be used. This forces the technical object observation skills.





Example of questions :
- Describe that object, what it's made of, what can it be used for ?

Types of expected answers :
There is a light that should illuminate.
There is a coil with metal wire.
There is a wheel with magnets. This wheel must rotate on its axle.
There is a cogwheel that must cog on the small wheel with magnets.
This is probably due to rotate wheels that will produce something...
Turn on the LED ?
This object can be named a light appliance or rather generator or dynamo, ....

Student sheet page 06.

# Educational operation 2/2

## 2 - Description of different parts

After the informal discovery of the test stand, ask to name each element on a drawing and give all the visibles features.

Student sheet page 07, correcting elements below :

Part 1 - Plate :
White light plastic. 256 x 80 x 10 mm rectangular parallelepiped form.
Parts cut into a drilled plate. Used as holder to all other parts.
Part 2 - Axles :
Plastic or alu ring. 6 mm diameter x 50 mm high. Cylindrical form.
Part cut into a ring. Used as holder and guide to rotating wheels.
Part 3 - Bobine :
“enamelled” copper wire (isolated with a varnish) wrapped as a 30 diameter x 40 lengh coil .
Used to produce electricity.
Part 4 - Terminal :
Plastic and metal. 16 x 14 x 13 high. Parallelepiped general form.
Molded part (injection in a mold) arround metal connectors. Used to connect wires.
Part 5 - LED :
Transparent plastic and metal. 10 mm diameter x 14 high. Cylindrical form.
Molded part (injection) arround metal elements. Used to produce light.
Part 6 - 40 cogs cogwheel
Soft plastic material. 168 diameter x 6 mm thickness. Cut disk like a cogwheel.
Handles as crank type attached on the top.
Part realized by cutting into a plate. Used as a crank to transmit movement to the small wheel.
Part 7 - Rotor
Soft plastic and metal materials. 70 mm diameter x 17 mm thickness. Disk general form. 10 attached magnets on the top; 8 cogs cogwheel attached on the bottom. Part realized by assembling cut parts and magnets. Used to make varying magnetic fields in front of the coil to produce electricity.

## 3 - Utilization of the test stand to produce electricity and turn on the LED

Let students running the test stand. They are asked to describe what happen.

Correcting elements below :
- LED turns on when one rotate the crank.
- Whatever the direction of rotation, the result is the same.
- The more one rotates fastly, the more the LED produce light.
- LED illuminates thanks to electricity (wires presence). It’s the wheels rotation that produce electricity. It’s magnets displacement in front of the coil that produce this current.

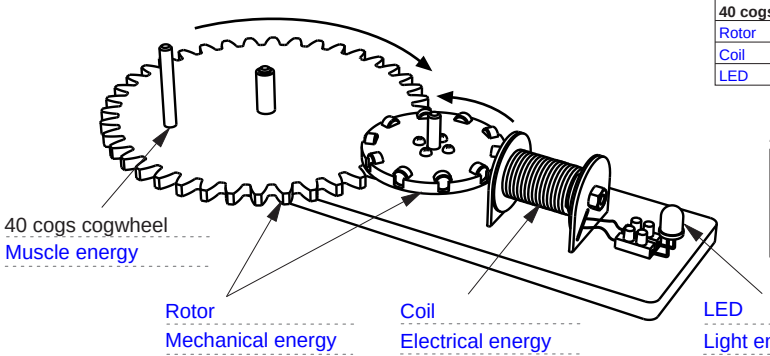
These practical observations on the test stand can be followed by a simple course about electrical current production. A parallel can be made with a cycle dynamo, a crank flashlight, a car alternator, an electric power plant, ...

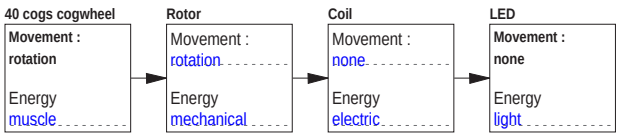
## 4 - Functional mapping: energy transformation

Identify on drawing the main elements and nature of energy which they are associated.
Identify movements of the main elements and they functions.
Complete a diagram that shows the chain of energy transformation on the test stand :
- muscle energy - mechanical energy - electicity - light energy.

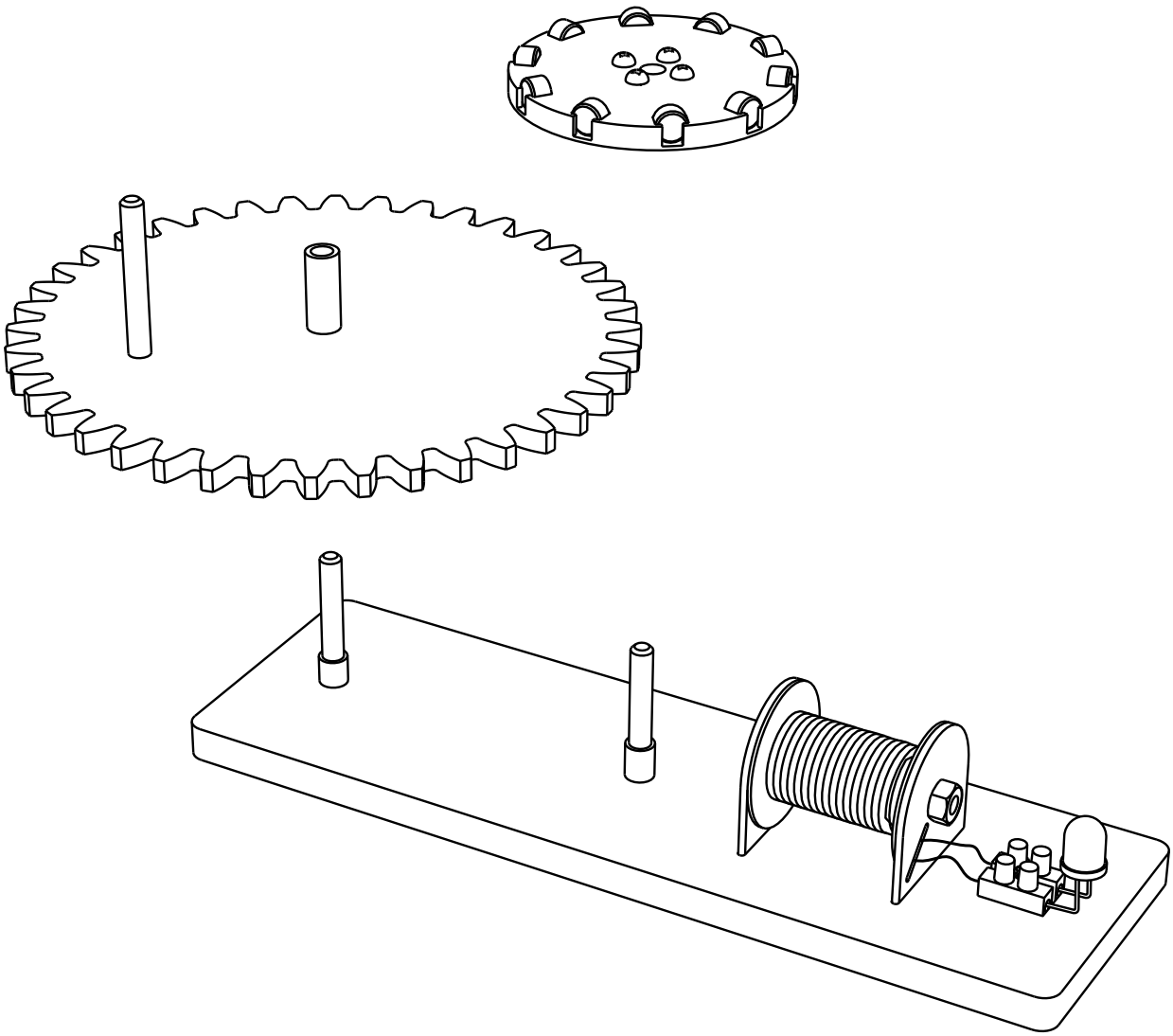
Student sheet page 09, correcting below.

| Element | Movement | Function |
|---|---|---|
| 40 cogs wheel | Rotation | Allows to initiate a movement with the crank, Cog the rotor |
| Rotor | Rotation | Allows to rapidly move magnets in front of the coil |
| Coil | None | Generate an electric current from a magnetic field variation |
| LED | None | Converts the electric current into light |



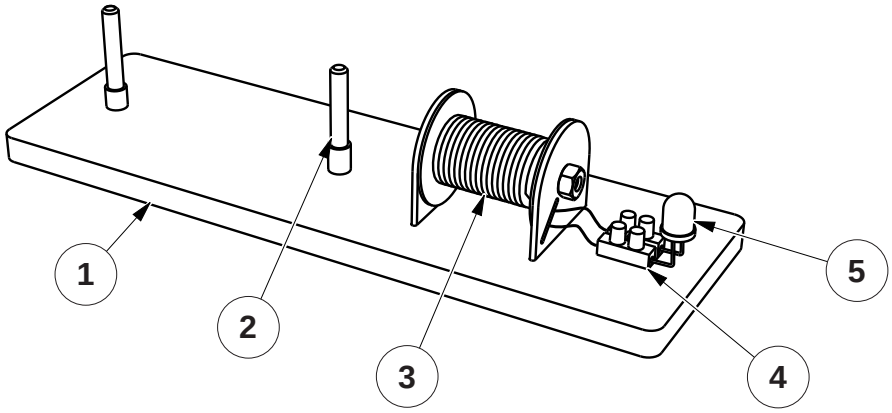



# Discovery and observation of a technical object



**You have a technical object shown above.**
By observing it ant trying to make it run, describe it by answering these questions : what is it made of, what can it be used for , how could it be named ?

# Description of different parts 1/2




**Descriptionof part 1**

Material, colour : .....

General form : .....

Fabrication : .....

Function : .....

.....

**Description of part 2**

Material, colour : .....

General forme : .....

Fabrication : .....

Function : .....

.....

**Description of part 3**

Material, colour : .....

general form : .....

Fabrication : .....

Function : .....

.....

**Description of part 4**

Material, colour : .....

General form : .....

Fabrication : .....

Function : .....

.....

**Description of part 5**

Material, colour : .....

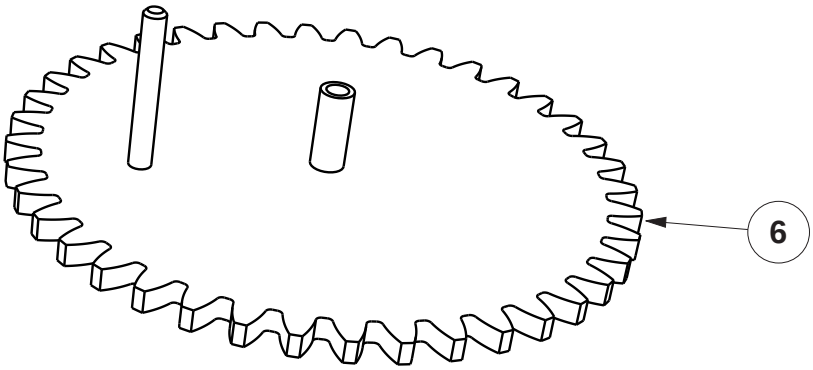
General form : .....

Fabrication : .....

Function : .....

.....

# Description of different parts 2/2




**Description of part 6**

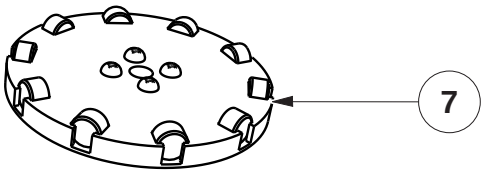
Material, colour : .....

General form : .....

Fabrication : .....

Function : .....

.....




**Description of part 7**

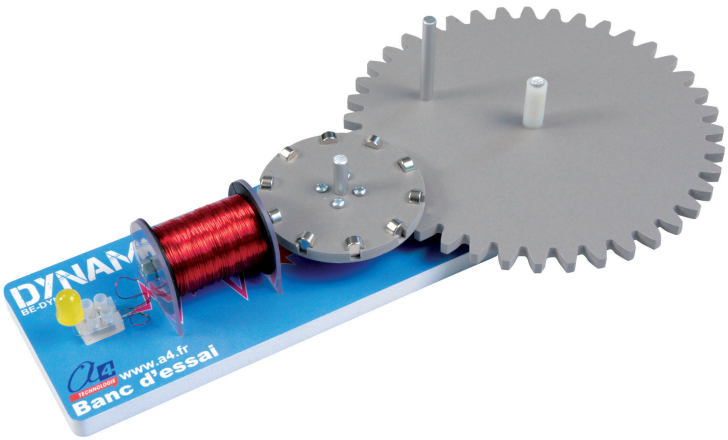
Material, colour : .....

Forme générale : .....

Fabrication : .....

Function : .....

.....

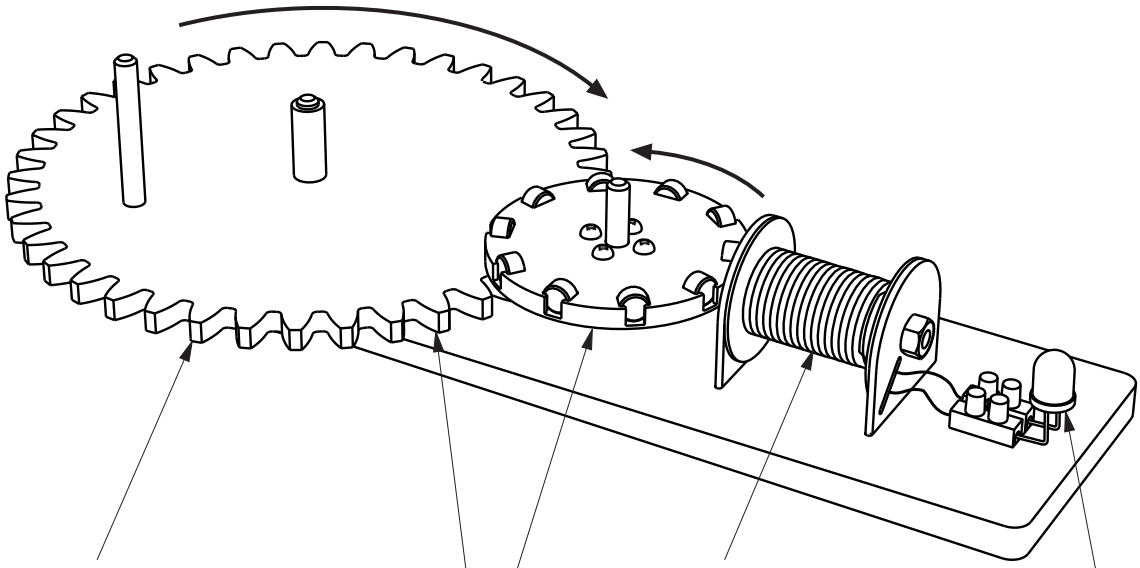


# Fabrication sheet - From K-HT kit evaluation

## 1- Locate different energies types transformed in this mechanism.

Complete drawing below by indicate, for each part marked by its designation, the energy type :

- Electrical energy
- Mechanical energy
- Light energy
- Muscle energy



40 cogs cogwheel .....

.....

.....

.....

.....

.....

.....

.....

## 2- Movements identification

Complete the table,
Indicate with arrows on drawing above, movements of mobil parts.

| Element | Movement | Function |
|---|---|---|
| 40 cogs wheel | Rotation | ..... |
| Rotor | ..... | ..... |
| Coil | ..... | ..... |
| LED | ..... | ..... |

## 3- Complete the diagram that represents the energy transformation chain in this mechanism.

| 40 cogs cogwheel | Rotor | Coil | DEL |
|---|---|---|---|
| **Movement : rotation** | Movement : ..... | Movement : ..... | **Movement : none** |
| Energy ..... | Energy ..... | Energy ..... | Energy ..... |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