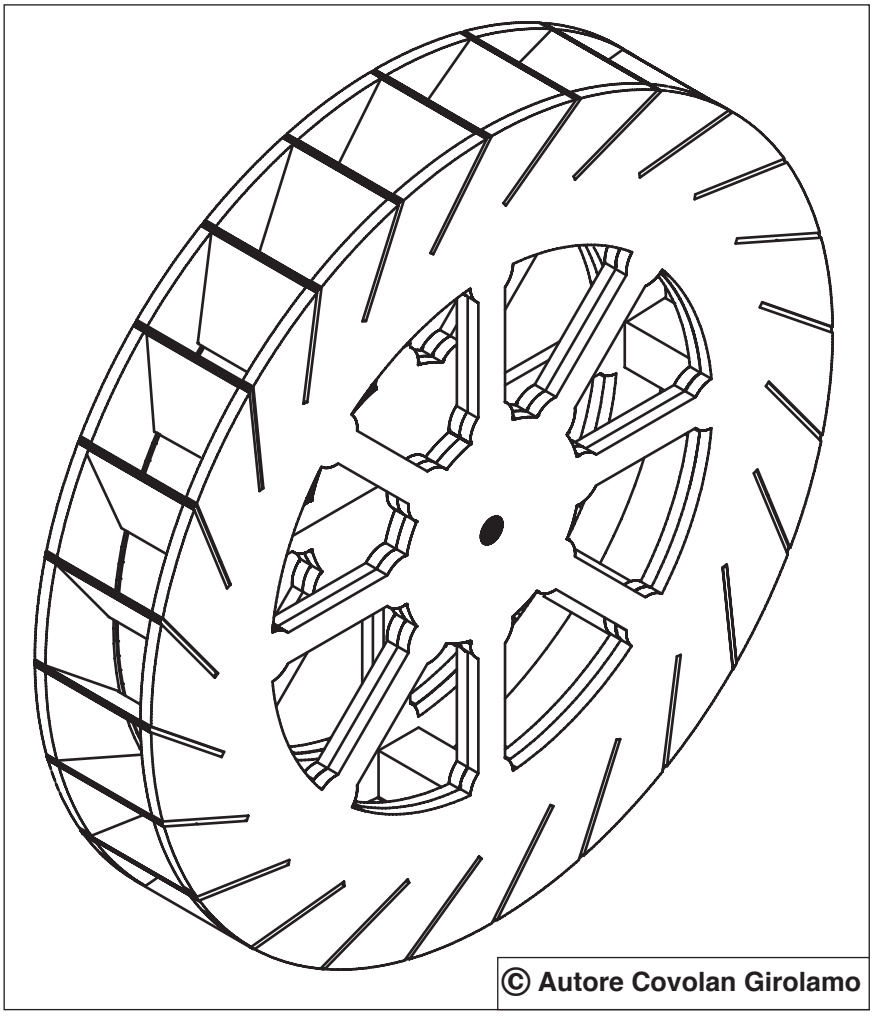
OPITEC

Hobbyfix

100.906

Water Wheel



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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 Technolo- gy.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. Dan- ger of suffocation!

1. Product Information:

Article: Functioning wood model, in project pack format.

Use: In Design Technology, Key Stage 3/4

2. Material Information:

Material: Pine (Coniferous) softwood
Gabun and modelling plywood, multi-layered and glued.

Working: All wood parts must be sawn, drilled planed shaped and sanded.
Mark out using measurements or use the patterns supplied.

Joining: Use waterproof glue on all the joins.
Insertion.

Finish: Wax (solid or liquid)
Wood varnish (Undercoat and top coat)
Staining (Coloured and water soluable – finish with varnish)
Linseed oil

3. Tools:

Saws: Use a **Fret saw** for all round shapes and curves which cannot be sawn with a straight backed saw (Baier fine saw)

Note! Fret saw blades should be inserted with the teeth facing forward.

Use a Fret saw board and work with slow constant stokes turning the work as you go.

Use a **fine toothed saw** (Baier fine saw) for all straight cuts in dowel and pine strip

Note! For safety and accuracy hold the work on a bench hook, when sawing.

Rasps and Files: Choose the correct grade of rasp or file for the work in hand.

Note! Rasps and files only cut on the forward stroke.

Sanding: Use a block and glasspaper on flat surfaces and loose sheet on curves and holes.

Drilling: Use an electric pillar drill.

Note! Remember to adhere to the safety rules when drilling: Tie all long hair back, wear safety glasses, remove jewellery and rings, wear an apron.

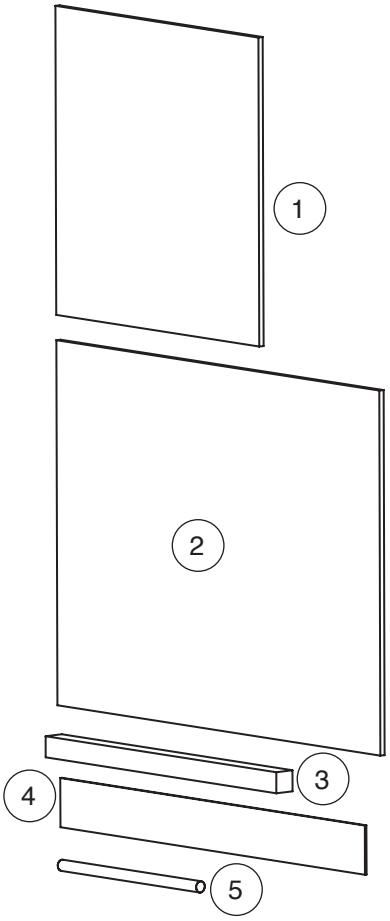
Hold the work in machine vice and use only sharp drills.

Clamping: Use G Clamps to hold the work whilst the glue is drying. Do not over tighten them or they may leave marks on your work.

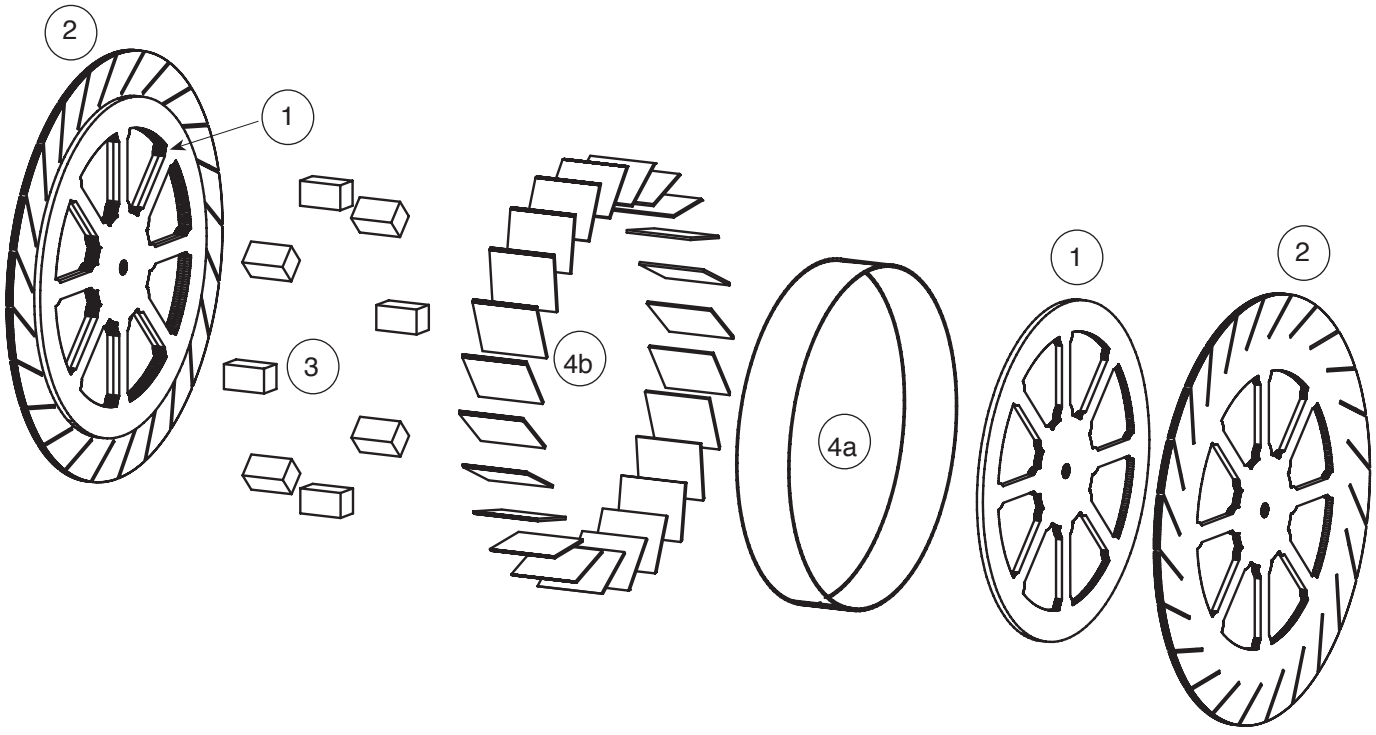
E100906#1

4. Parts list:

Part	Material	Quantity	Size
Small wheel	Plywood	2	4 x 220 x 220 mm
Large wheel	Plywood	2	4 x 260 x 350 mm
Cross members	Pine strip	1	15 x 15 x 250 mm
Scoops	Plywood	6	1,5 x 35 x 330 mm
Shaft	Dowel	1	8 dia x 250 mm



5. Exploded diagram



6. Planning overview

6.1 Planning and making the large wheel

6.2 Planning and making small wheel

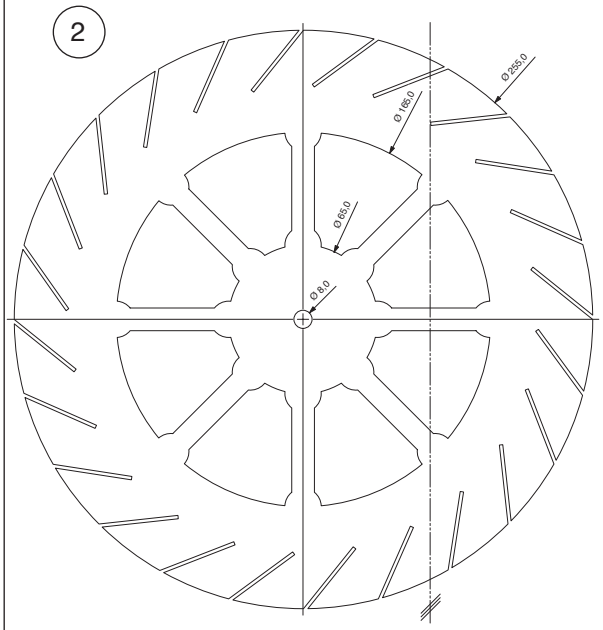
6.3 Assembling the wheels

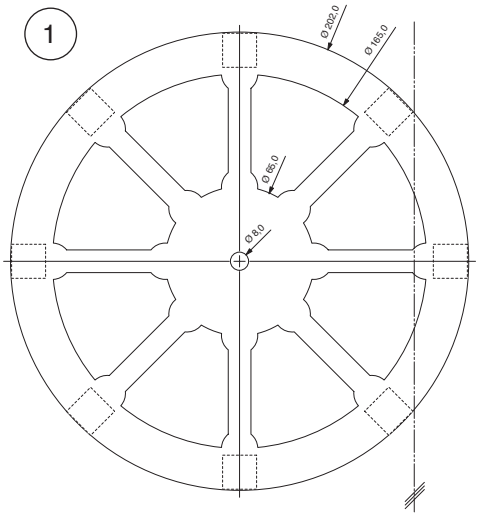
6.4 Making and assembling the rim

6.5 Designing and assembling the scoops

6.1. Planning and making the large wheel

6.1.1 Glue the plans for the large and small wheels together along the marked lines.

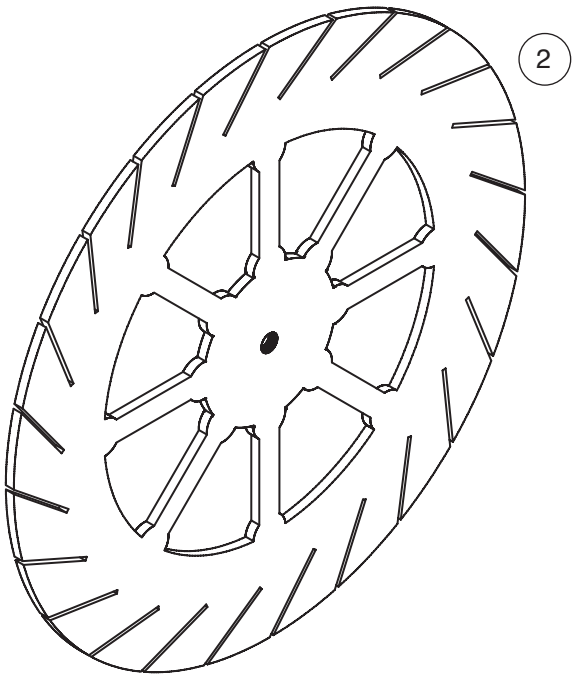




6.1.2 Trace or mark out the shape for the large wheel on to the plywood sheet (2)
Firstly saw out the wheel shape and then the slots for the scoops. Mark and drill the 8mm centre hole then finally saw out the eight fields. (triangular shapes)

Note: Before starting lightly pin (insert pins in the triangular cut outs) the two plywood sheets together so that both halves of the wheel can be sawn at the same time!

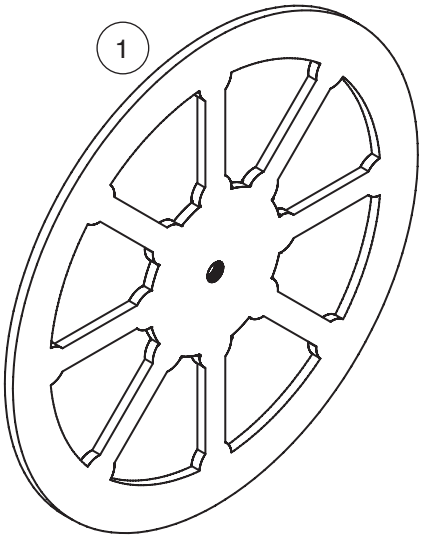
6.1.3 Sand all the parts.



6.2. Making the small wheel

6.2.1 Trace the shape (or measure) the small wheel on to the plywood sheet (1)
Firstly saw out the main outside shape, then drill the 8mm diameter centre hole. Finally saw out the eight triangular shapes

Note: Two wheels are needed, so join both wheels together by nailing them through the fields (cut out s h a

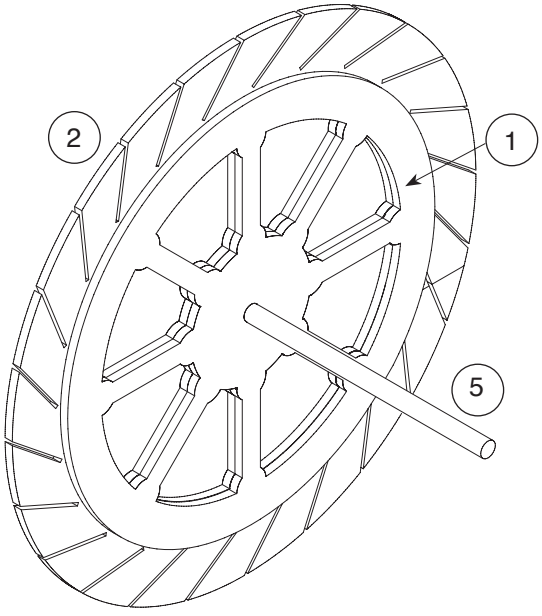


pes in the centre) and sawing / drilling both halves at the same time.
6.2.2 Sand all the sawn edges.

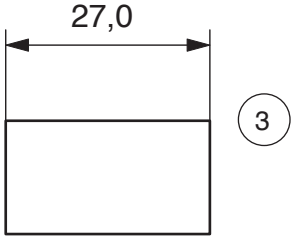
6.3. Assembling the wheels

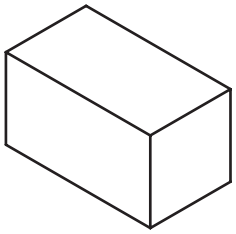
6.3.1 Start by gluing a small wheel on top of a larger wheel.

Note: Insert a dowel through the centre so that the wheels line up properly.

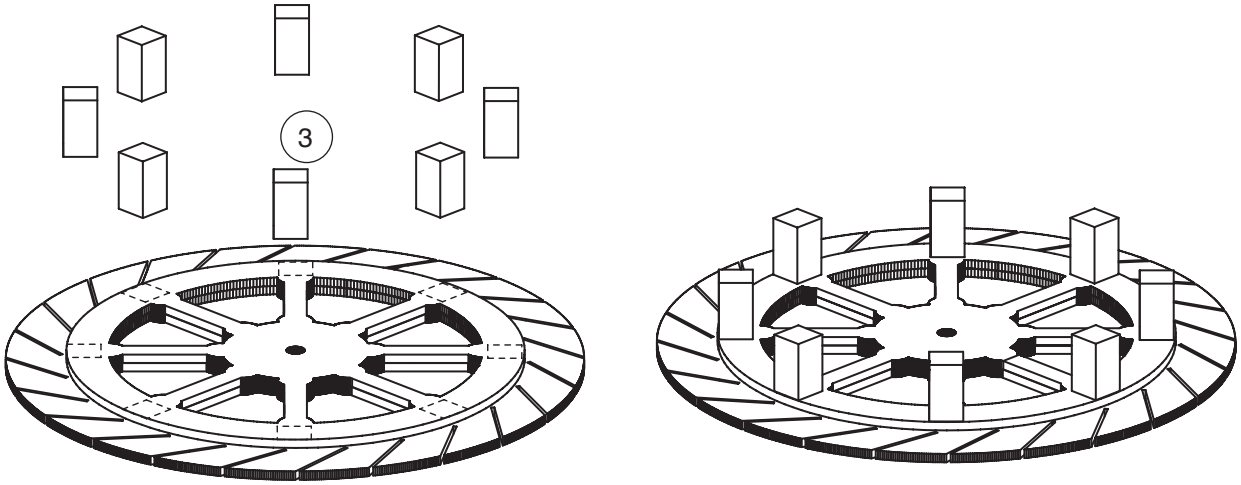


6.3.2 From the pine strip (3) 15 x 15 x 250mm measure out and saw 8 spacers each 27mm long. Sand the ends.



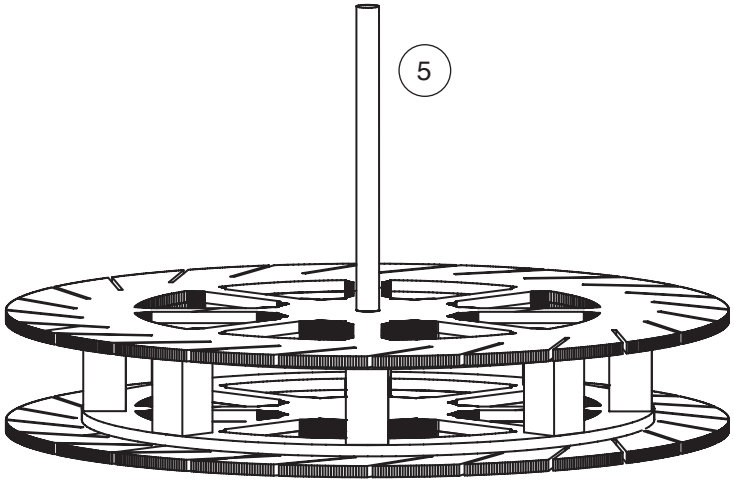


6.3.3 Glue these spacers around the edge of a small wheel as shown



6.3.4 Next glue the second pair of wheels (smaller one face down) on top of the spacers on first wheel as shown in the diagram. Insert a length of dowel through the centre hole to ensure that they all line up properly. Apply a weight to the completed wheel and allow the glue to dry.

Note: To insure the wheels line up insert a dowel (5) through the centre. Place a wheight on the wheels whilst the glue is drying.



6.4. Making and assembling the rim

6.4.1 Measure the circumference of the small wheel by placing a length of string around the outside.Fold the string in half and measure out this length on the two plywood strips (4)
You can also work out the size of the circumference mathematically using the following formula :

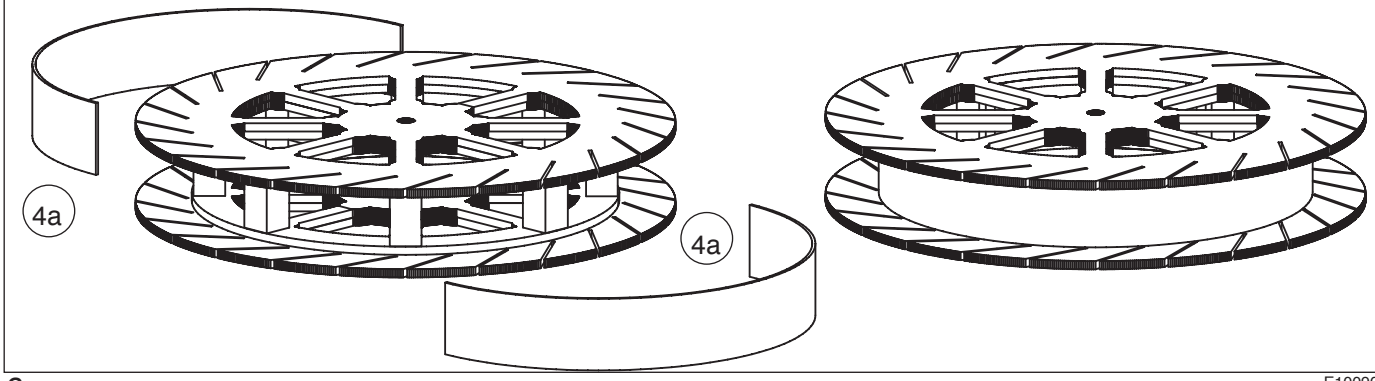
Diameter x 3.14 = circumference

202 x 3.14 = 634.28mm

634.28 divided by 2 = 317.14mm

6.4.2 Glue both of the plywood strips (4a) around the edge of the smaller wheel. Arrange them so the ends meet on a spacer. (3).

Note: Hold the strips in place with a strong rubber band or pin it in place with veneer pins. Leave the glue to dry well!!



6.5. Making the scoops

6.5.1 Using the remaining plywood strip (4) saw 24 pieces each 43mm long. Sand the ends!

Note: Check that the parts are sawn at right angles (use a mitre saw set at 90 degrees)!!

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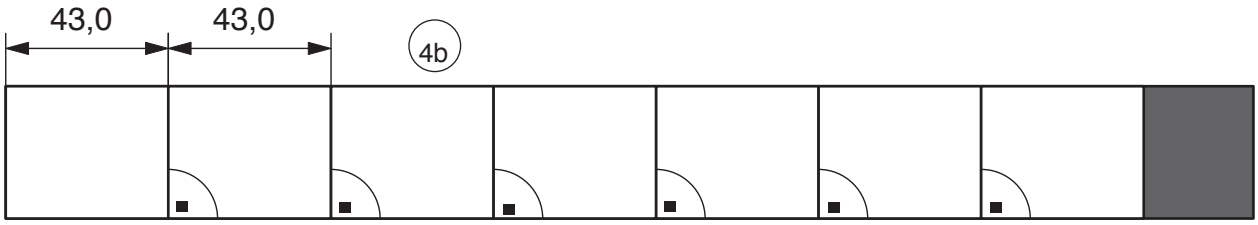
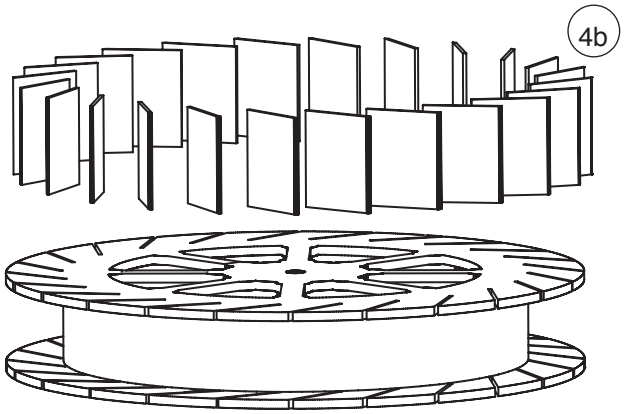
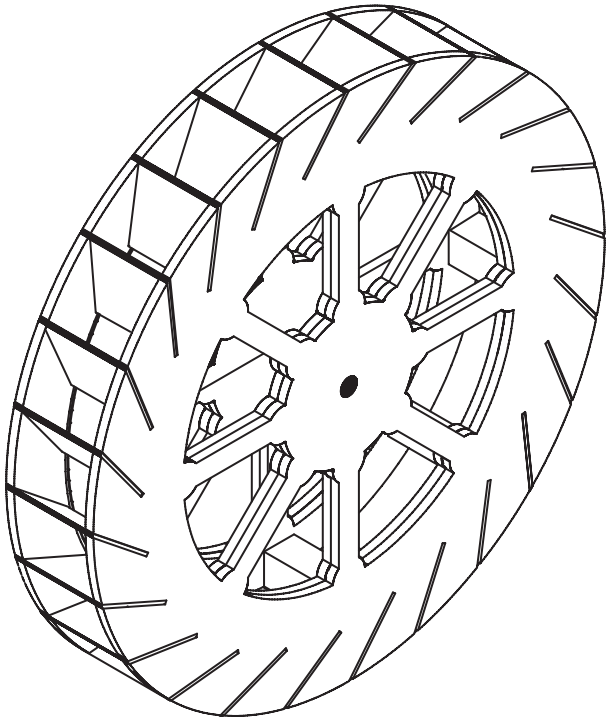


6.5.2 Arrange the parts so that they slot into the edge of the large wheel (2) forming scoops
They must all face in the same direction.





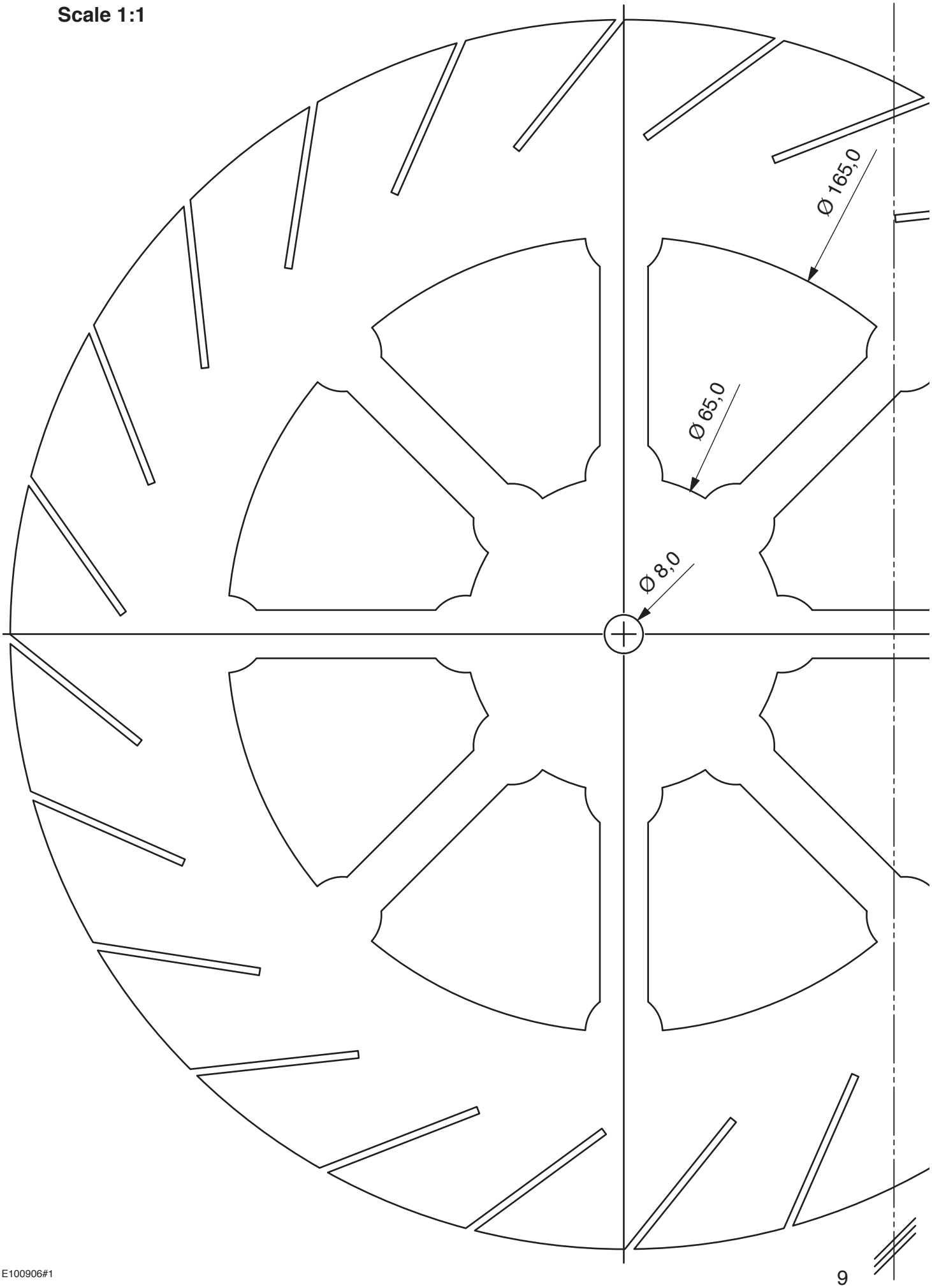
6.5.3 Sand and remove any excess from the edges and then
coat the wheel with several layers of varnish to ensure that it is really waterproof.

6.5.4 The water wheel is now finished and can be used on its own or it can be used in conjunction with the Leonardo da Vinvci gearbox (Project 100 917)
To do this remove the crank handle from the Leonardo gearbox and then slide the water wheel on the shaft in its place.

Note: Before the wheel is driven using water it MUST BE varnished !

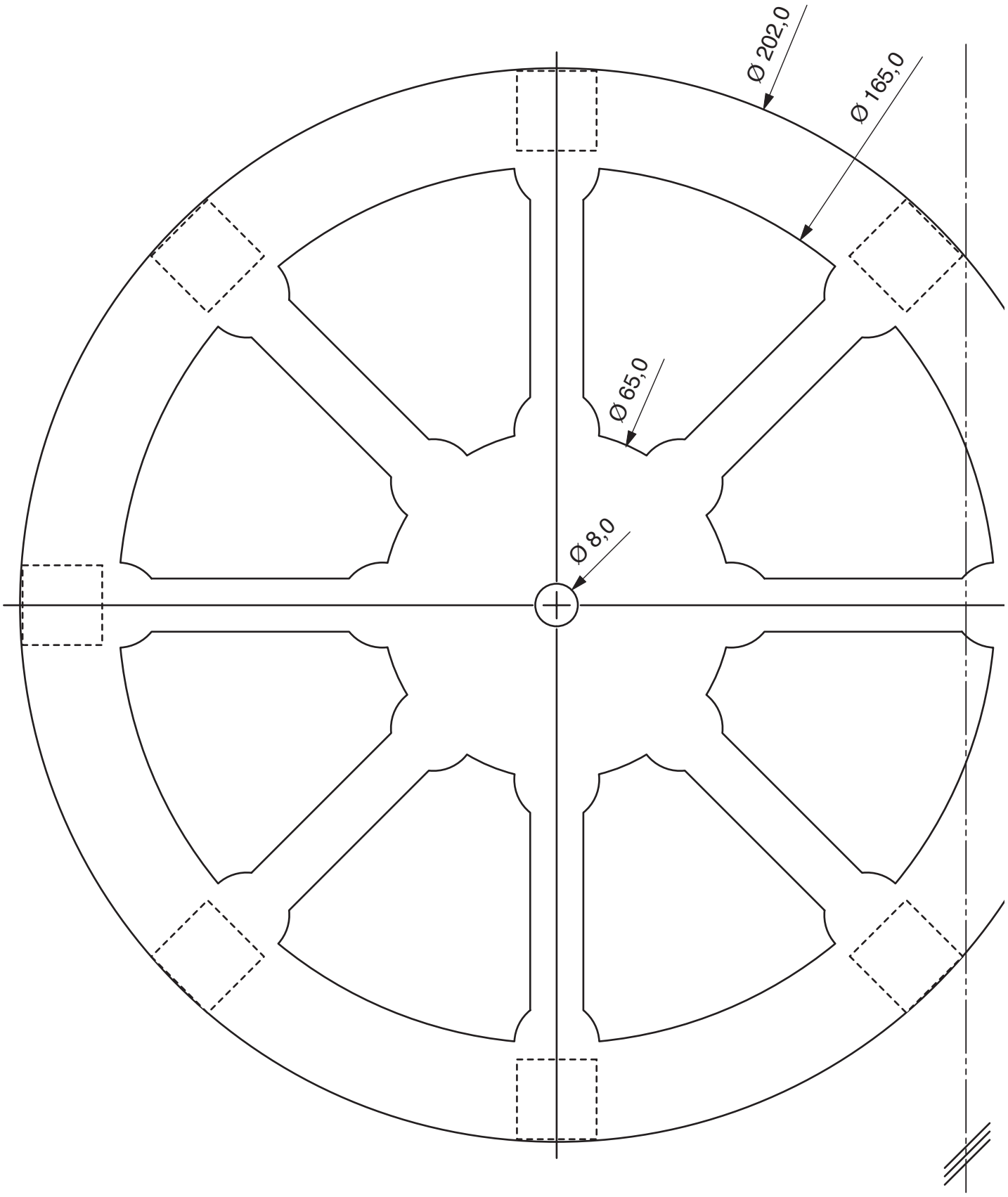
Pattern for the large water wheel

Scale 1:1



Pattern for the small water wheel

Scale 1:1



Patterns for the large and the small water wheel

Scale 1:1