



Tethered Mini Sumo Robot Kit Instructions



We at the Manitoba Robot Games, want you to have a successful and fun time building and competing with your Mini-Max Mini Sumo Robot. If you have any comments please direct them to ian@mbrobotgames.ca

Follow these steps to construct your robot

STEP 1

READ all the instructions carefully before opening any packages!

STEP 2

There are many ways to build your robot. Study the options and make a decision. You can always rebuild it later in a different configuration. Winning robots are always the result of testing, modifications, rebuilds, improvements, sweat and some luck.

Tools

You will need...

Hobby Knife., Small Side Cutters, #0 & #1 Phillips Screwdrivers, Small Needle nose Pliers, Soldering Pencil and Solder. To customize your robot, Paint, Decals or Pictures may be useful. Also useful, Electrical Tape, Urethane glue or 5min Epoxy.

The safest knives are sharp ones. Hobby knives can be sharpened on a small piece of waterproof sand paper about 320 or 400 grit (that is the black sandpaper with the green backing).

Options

Gearbox

The Tamiya gearbox that is included in your kit can be assembled in one of four ways as shown on the gearbox carton. Each gives a different gear ratio. 'A' is the fastest but has the lowest torque (a measure of its strength), while 'D' is the slowest and strongest ratio. For the first time builder we suggest you use the 'C' ratio for a tethered robot, but be sure to keep all the extra parts and instructions so that you can change it at a later time.

Type A - 1039 rpm,
Type B - 345 rpm,
Type C - 115 rpm, &
Type D - 38 rpm.

The A and C type have the axle positioned about 12 mm in from the back of the gearbox, while the B and D type are about 25mm from the back. If you use type B or D, you may need to remove a little of the plastic from the body to give better clearance for the wheels.

Body

You have been given a preformed PETG plastic body with your kit. You don't have to use this, you may choose to modify it or make a body from some other material.

Weight/Traction

The maximum weight allowed in competition is 500 grams. One of the rules says that, to qualify to enter, the robot must be able to move a block that weighs 500 grams, so you might consider ways to increase traction between the robot and the playing surface.

In short, your options include;

Gear ratio (A, B, C or D), Shape of Body, Weight of finished robot, Traction provided by the tires, and how your robot is decorated, but be sure to display clearly your robot's name or ID.

STEP 3

Collect all the tools you will need, and especially a tray so that small parts have less chance of rolling onto the floor and falling into oblivion.

STEP 4

Open the box of parts for the gearbox and try to identify the parts. Don't open the bags until you are ready to use the contents.

STEP 5

Follow the instructions that came with the gearbox. for either the A, B, C or D type.

STEP 6

If you chose to build the A or C type then the plastic can be used as is. Follow the instructions for Shaping the Body A/C.

Assembling the Gear Box

When assembling the gear box follow the instructions that are included in the box of parts.

The Plastic Body

There is room for a great deal of flexibility in the design of your robot body, however for the first time builder we suggest you follow these instructions first, then make your own special improvements later.

The supplied body is formed from PETG. PET is the same material that is used for making soft drink bottles but this sheet has been glycolized which gives it some extra impact properties. PETG is an impact resistant clear plastic sheet that can be bent with or without heat, drilled, cut with shears or scored (in straight lines) then snapped with your fingers. It can be glued using (two part) 5min Epoxy or Urethane such as Gorilla glue, LePage Premium or Elmer's Ultimate.

To form a sharp corner, place on the edge of a sturdy table or counter top and bend the sheet over the edge of the table. Once a bend has been established, a sharper angle can be had by folding it further in your hands. PETG can almost be folded back on its-self before it starts to show significant weakening, but don't work it back and forth as this will weaken it and may snap.

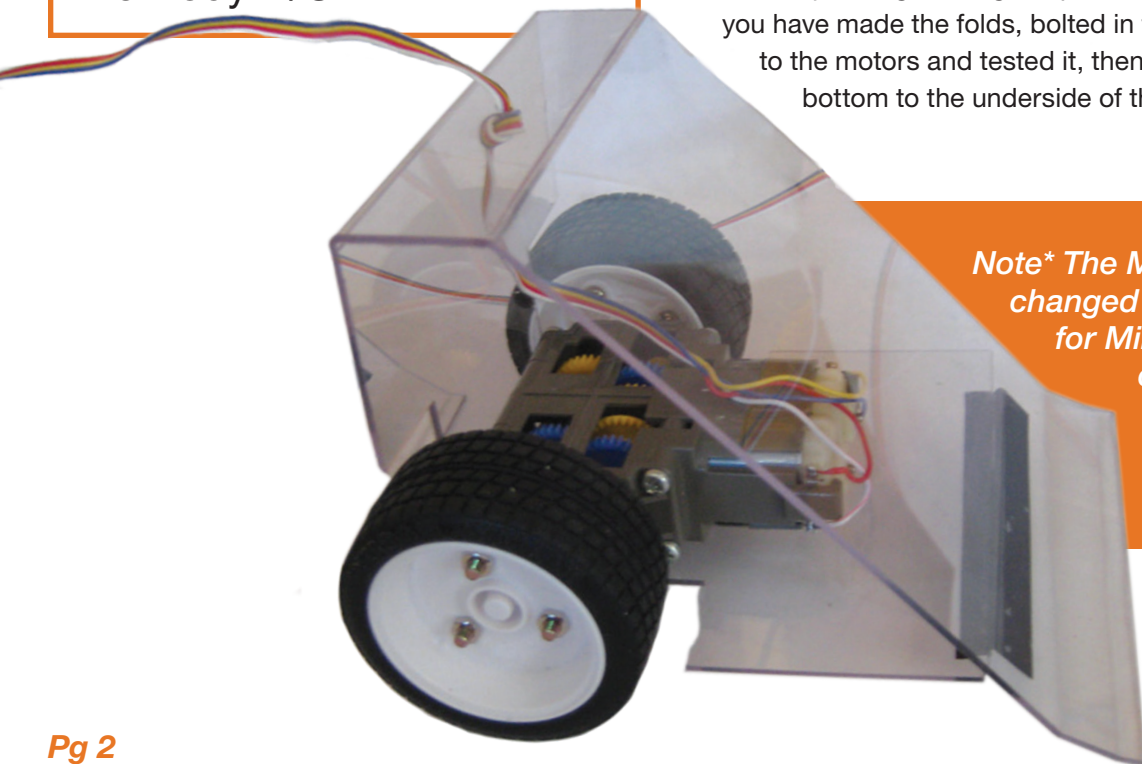
To make a curved surface, form the sheet over a round object such as a broom handle or rolling pin or simply roll it between your hands.

Shaping the Body, A/C

The body has been supplied with two 90° bends leaving the center open for you to mount the gearbox inside and do the wiring easily, but before adding the gearbox, we suggest you rough shape the long part of the body to form the top and front.

You can follow the guide on the back page to make a couple of different shapes or simply roll the top over in a curved shape. Make sharp bends over a sharp edged table. The small hole in the center of the top close to the back is just large enough to pass the four control leads through. Once you have made the folds, bolted in the gearbox, and soldered the wires to the motors and tested it, then simply glue or tape the edge of the bottom to the underside of the front.

Note The Manitoba Robot Games changed their size requirement for Mini Sumo, so if you wish to compete in Manitoba or other provinces, be sure to check the appropriate web site for current rules.*



STEP 6 CONT...

If you chose to build the B or D type then check the instructions for **Altering the Body - B/D**

STEP 7

Making the Electrical Connections

STEP 8

Optimize Performance

STEP 9

Optimize Appearance

Altering the Body - B/D

If you are using the B or D type gear ratio then the axle will end up being 12 mm further forward so you will need to trim away some of the base to give clearance for the front of the wheels. Carefully score the body where you need to cut it, then use side cutters to persuade the plastic to snap on the score lines.

Optimizing Appearance

There is only one rule that applies here, which states that the name of the robot or suitable identity for the robot must be clearly visible so that spectators can identify the contestants. There are many options here. You could paint the body or glue on a print of your own design or some clip art, sponsor's decals, or simply have the robot's name emblazoned across the front. It is your choice. Have fun with this step but remember to keep the message appropriate, after all, your robot may be displayed in the news media.

Making the Electrical Connections

The controller in your kit will need some assembly. There are instructions inside the shrink wrap. Some soldering skills will be needed. There are some good instructional links on how to solder on our webpages at www.mbrobotgames.ca/soldering.

Pass the wires from the controller through the hole in the top of the body and tie a knot in them so that the wires cannot be pulled out of the body while leaving enough length so that they will pass safely along the body to the solder tabs on the ends of the motors. Install two "AA" cell batteries into the controller body and then hold the Blue and Yellow wires to the right motor tabs. Push the right controller lever forward and look at the direction that the wheel rotates. It should be going forward or clockwise looking at the wheel hub. If that is not the case then swap position of the Blue and Yellow wires and try again.

When you are satisfied that you have the correct wiring pattern, you may solder these connections. Repeat this with the left motor and the White and Red wires.

Optimizing Performance

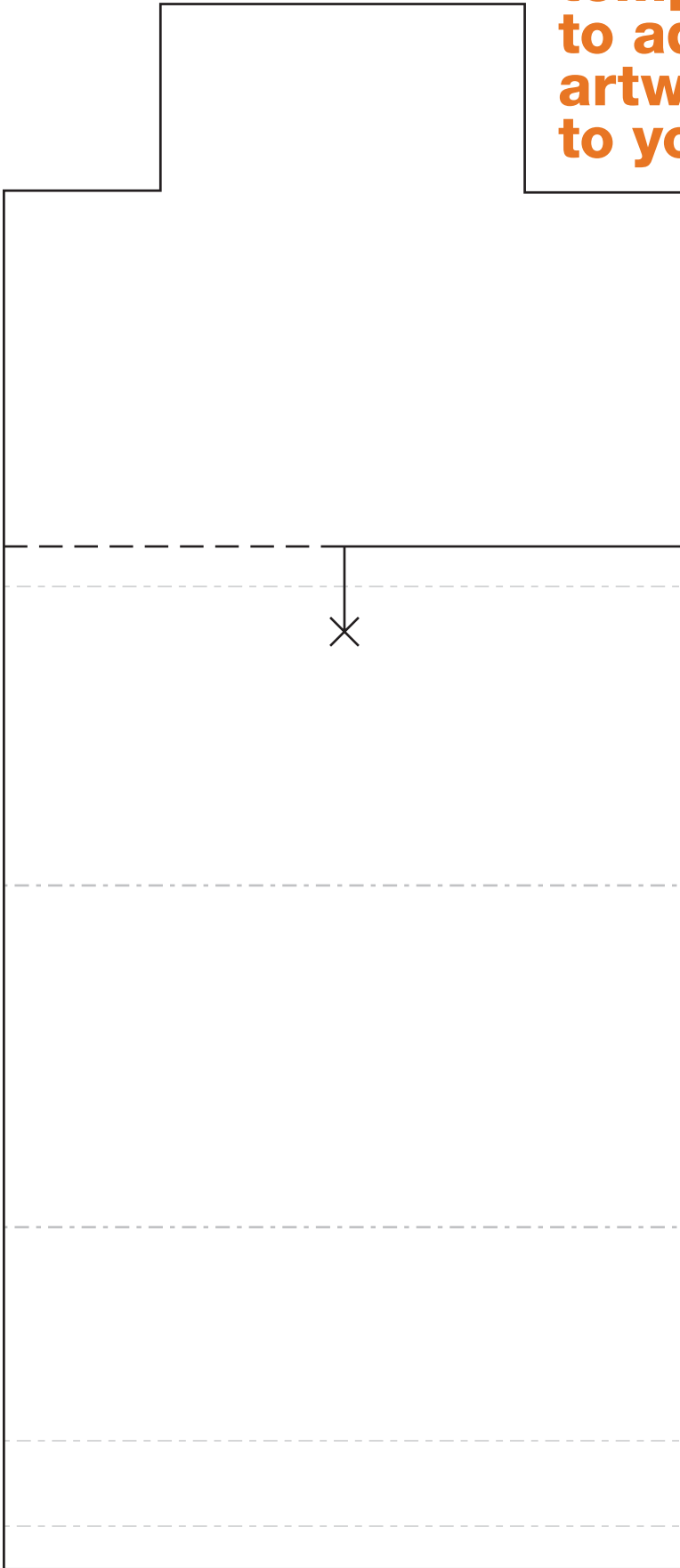
Your physics teacher will tell you that your robot is unlikely to go fast enough to consider the 'Coefficient of Drag' or a 'Reynolds number' but the 'Coefficient of Friction' is of utmost importance as this will determine how much of the developed power can be transmitted into motion.

The **constants** are the 'Sintra' playing field surface and the available speed and torque produced by the Tamiya Gearbox.

The **variables** (these are the things you can change) are the tire surface, the friction in the gearbox which reduces energy delivered to the wheel and tire, and the downward force (too much and the gearbox will go slower, too little and the tires will not grip the surface). Remember, the maximum allowed weight of the robot excluding the controller is 500 grams. we suggest you aim for about 480 gr.

Be creative, and have fun!

Use this template to add artwork to your



Each robot should be unique and identifiable.

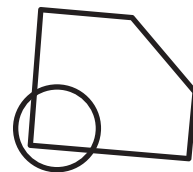
Don't forget to add your robot's name!

A - 5.75" (145mm)



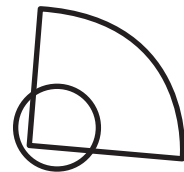
Fold at A

B - 4.0" (100mm)



Fold at B

B - 2.0" (50mm)



Fold on Dashed Lines -----

Cut on Solid Lines _____

Cut the X to make way for the Wires _____ X

A - 0.75" (19mm)

A - 0.25" (6mm)

0.0" (0mm)