



Eurobot<sup>open</sup> 2006  
"Funny Golf"

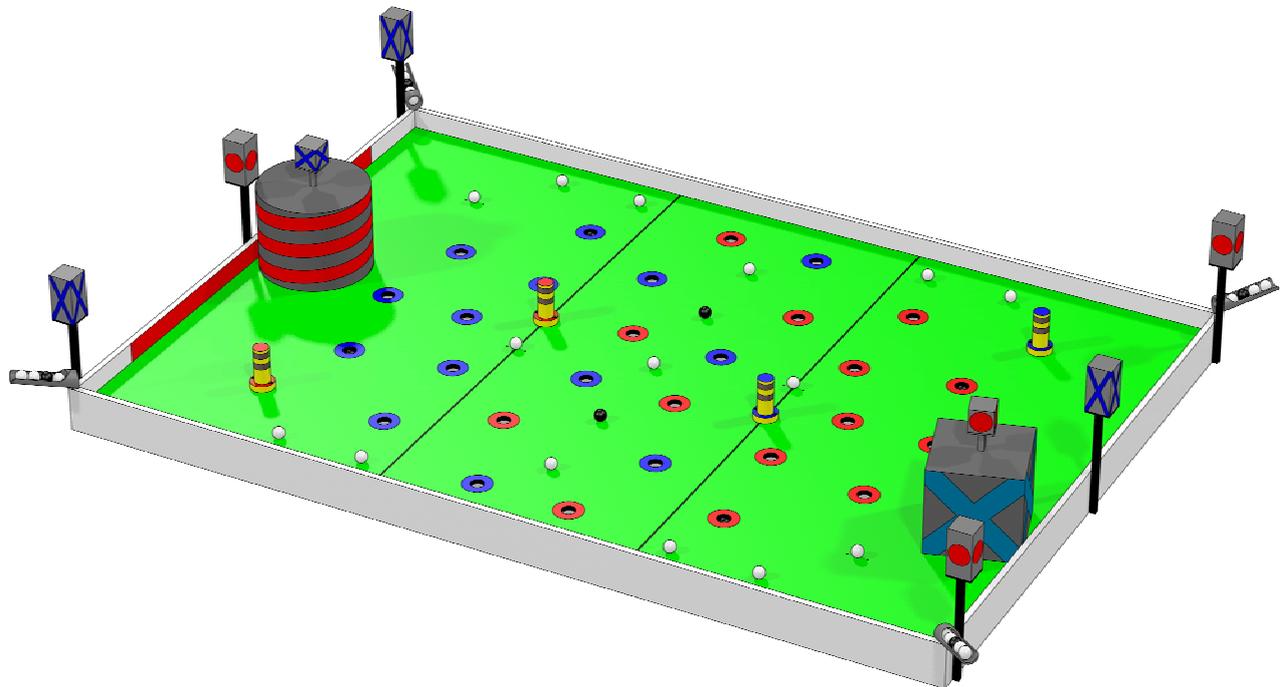


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Rules... Rules... Rules... Rules... Rules... Rules...

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# Funny Golf



*Two robots on a golf course!*

*The team which inserts the most white balls in his holes at the end of the match will be the winner.*

*But be careful, it is also possible to insert black balls in the opponent's holes to prevent him from scoring !*

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## 1. Scope

The following game rules are applicable to all national qualifications and the final of Eurobot<sup>open</sup> 2006 autonomous robot contest.

Eurobot<sup>open</sup> is an amateur robotics contest open to world-wide teams of young people, organised either in student projects as independent clubs, or as educational projects. A team is composed of several people.

The contest aims at interesting the largest public to robotics and at encouraging hands on, group practice of science by young people. Eurobot<sup>open</sup> (the final and the national qualifications are intended to take place in a friendly and sporting spirit.

This year the rules of Eurobot<sup>open</sup> are designed to make teams develop sorting tools and think up embedded systems for their robots. These items are encouraged by the fact that the robots have to find their way on the uniformly painted playing area, by the fact that the size maximum is smaller than last year and by the fact that they have to differentiate two types of balls and to treat them in two different ways. Succeed in this technical challenge may allow contestant to design the robots of tomorrow.

These subjects can be useful for different kind of research thematics in the professional future of the participants:

- o Personal mine clearance (detect and lift mines).
- o People and object avoidance (build robots that must not push people or hit small children).
- o Robot rescue (free people in accident scenarios).
- o Autonomous harvesting.

More than an engineering championship for young people, Eurobot<sup>open</sup> is a friendly opportunity to unleash technical imagination and exchange ideas, know-how, hints and engineering knowledge around a common challenge. Creativity is at stake and interdisciplinarity is necessary. Technical and cultural enrichment is the ultimate goal.

Participation in the competition assumes full acceptance of these principles as well as the rules and any interpretation of them that will be made by the refereeing committee (throughout the year) and by the referees (during matches). The referees' decisions are final and may not be challenged unless an agreement is reached between all the parties involved.

Eurobot<sup>open</sup> is a contest taking place in Europe, but is open to other continents. The countries presenting more than three teams shall organise a national competition (or national cup), in order to select three teams amongst them. The selection will typically include the two most competitive teams. But it is left to each national organisation committee to agree on a possible alternative to competition for selecting its last team. For example, the third team can be chosen by a jury according to other qualities valued by the contest as: best-concept, creativity, fair-play, etc.





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Eurobot values fair play, solidarity, technical knowledge sharing and creativity both through techniques and project management more than competition itself.

The lucky selected teams during the national robotics cups of Algeria, Austria, Belgium, Czech Republic, France, Germany, Italia, Romania, Serbia-Montenegro, Spain, Swiss, UK and any 2006 new selection will meet their international counterparts in June 2006, in Catania (Sicily, Italy) to compete for the Eurobot<sup>open</sup> final.

Eurobot<sup>open</sup> was born in 1998, in the wake of the French Cup of Robotics, following the constitution of a similar competition in Switzerland. Today, to deal with the expansion of the contest and to maintain the original spirit of exchange and cooperation between the different organisers, a European Association gathering all the parties involved has been created. The association, officially born in May 2004, was named Eurobot. You can find its statutes on our website ([www.eurobot.org](http://www.eurobot.org)). Individuals and structures sharing our values are most welcome, either to support or join as volunteers in the different organising groups.

It shall be noted that most national qualifications are open to foreign teams but in the limit of their resources, and that many teams organise their own friendly tournaments. It shall be finally noted that multinational teams are welcome.

Eurobot<sup>open</sup> is attended principally by volunteers from all nationalities who believe in the educational value of the experience, and are for most of them former participants themselves.

Welcome!

And have a nice adventure!





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## 2. Basic rules

This year, the robots are going to play Golf.

Each team shall design and build one robot. The matches involve two teams and last 90 seconds.

Each robot is associated with one colour (red or blue) and each hole is encircled by colour rings (red or blue). To win a match, one robot shall put more white balls in the holes encircled by its colour than the other robot. Moreover this robot can also insert black balls in the holes encircled with the other colour to make the other team's task more difficult and more fun!

Some balls are placed on the game area, but robots can also trigger the ball ejection mechanisms to release other balls (black or white). These mechanisms are activated by an electric contact on totems placed on the playground.

## 3. Playing area and element definition

### 3.1. Generalities

Part reference used for the game components design is placed in an appendix at the end of this document.

#### 3.1.1. Playing area overview

The playing area is made of:

- One rectangular table painted in green with 2 black lines which divide the table into three parts.
- 28 holes. The holes are encircled by blue or red rings.
- 31 white balls: 15 white balls are on the playing field and 4 in each ball eject mechanism. 11 of the 15 white balls of the playing area are in fixed positions and 4 are randomly positioned.
- 10 black balls: 6 on the playing field (2 balls are on the center line. The 4 others are randomly positioned in 4 holes, 2 per side, at the beginning of the game) and 1 in each ball eject mechanism.
- 4 totems are randomly positioned at the beginning of the match, with a central symmetry (see picture for the possible position of the totems).
- 4 ball eject mechanisms (with 4 white and 1 black balls in each mechanism), one at each corner of the field. Each of them is linked to the opposite totem (central symmetry).

The playing area is surrounded by a wooden border. It is 22 mm wide and 70mm high with respect to the table level. It is uniformly painted in mat white, except in front of the starting positions which are painted in blue and red (see the appendix). This border is considered as outside the playing area. Hence, it has not been taken into account in the floor dimensions set out below.

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Each team is represented by a colour (blue or red). The robot represented by the blue colour starts the game between the holes encircled with the red rings and the blue border, touching the border.

### 3.1.2. Tolerances

The organisers are committed to build the playing area to the highest degree of accuracy. But they do allow for the following fabrication tolerances:

- 2% with respect to the playing field construction,
- 5% with respect to the playing element construction,
- 10% with respect to painted markings.

No complaints related to fabrication variations within the above tolerances will be considered.

The teams are warned that the satin finish paint of the colour may vary in aspect from one playing area to the other and may degrade during the competition.

In case of major problems, some elements in the following definitions may possibly be modified over the course of the year. We strongly advise participating teams that they should consult regularly our web site [www.eurobot.org](http://www.eurobot.org) in the 'FAQ' section for potential official amendments.

Please note that: the above tolerances do not concern in any case the dimension limits, which apply to the robots and the possible localisation beacons prepared by the participating teams.

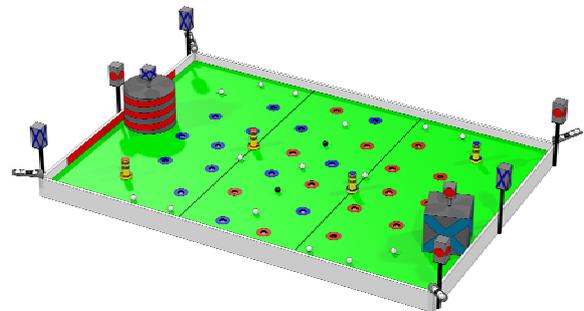
## 3.2. The playing area

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This table is 210 cm wide and 300 cm long.

It is painted in green. 2 black lines are painted at 105 cm from the smaller borders (through the axis of a possible position for the totem). Those lines are 0.5 cm wide.

To start, robots are simply requested to touch the border where it is painted in blue or red. The starting area is not delimited directly on the floor.



## 3.3. Border

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The border is 22 mm wide and 70mm high with respect to the table level. It is uniformly painted in mat white, except in front of the starting positions which are painted in blue or red (see the appendix).

## 3.4. Balls

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The white balls are ping pong balls. The black balls are also ping pong balls painted with India black ink.

The diameter of those balls is 40 mm.





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There are 31 white balls: 6 in each half of the playing area (4 have a well known position, 2 are randomly positioned at the beginning of the game), 3 on the centre line and 4 in each ball eject mechanism.

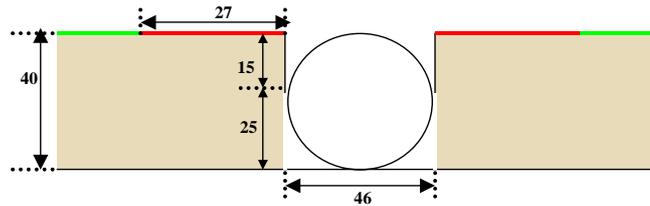
There are 10 black balls: 6 on the playing field (2 on the centre line and 4 randomly positioned in 4 holes, 2 per side - at the beginning of the game) and 1 in each ball eject mechanism.

The positions of the balls on the playing field are fixed or randomly defined at the beginning of a match (see table figure).

### 3.5. The holes

The playing area is perforated with 28 holes. The diameter of each hole is 46 mm. The holes are drilled through the playing area. They are 40 mm deep. The edges of the holes are painted in black with a mat finish. Reflective tape is fixed on the inside of the holes at 15 mm from the table surface. This reflector tape lets the robots detect the status of the hole : empty or full. The bottom of the hole is not completely closed (air can circulate through this hole). The holes are encircled by blue or red circles. The diameter of these circles is 100 mm. There are 14 holes surrounded with blue and 14 with red).

For the layout of holes, see appendix.



### 3.6. Totems

There are 4 totems on the playing area. Totems are 52 mm diameter cylinders and 147 mm high. They are made out of plastic (PVC). They are closed on the top.

To activate a totem, a robot must make an electrical contact between two central metallic rings.

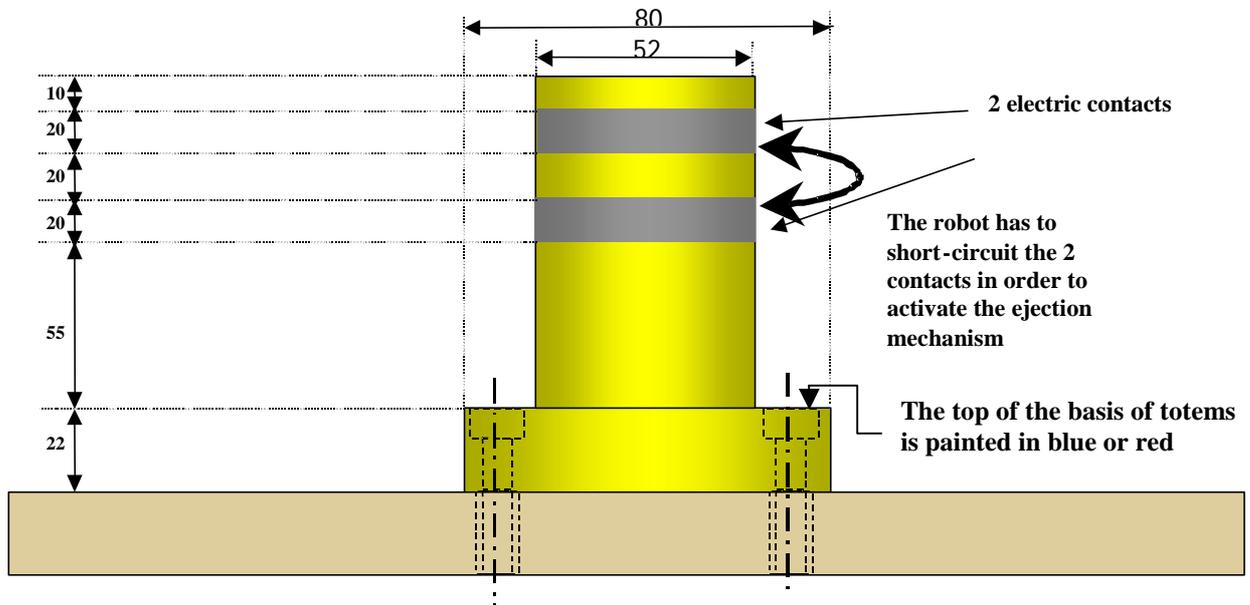
Totems are not dedicated to a single robot : robots can use each of the 4 totems.

At the beginning of the game, totems are randomly placed on the playing field (see picture for the possible positions of the totems).

Each totem is linked to the opposite ball eject mechanism (with a central symmetry).

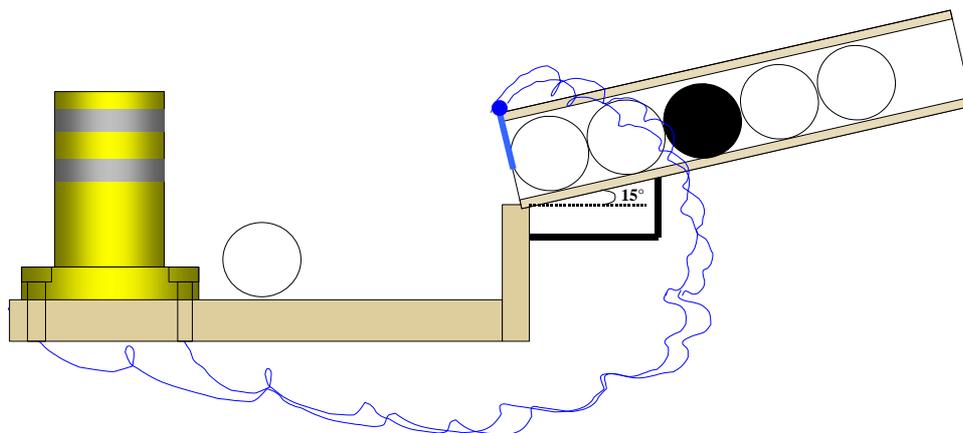


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### 3.7. Ball ejection mechanisms

At each corner of the playing area there is a ball release system. At the beginning of the game, each ball ejection mechanism contains five balls: 4 white and 1 black, following the layout drawn below.





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## 4. The robot

### 4.1. Generalities

- Each team has to build one robot.
- A robot is a fully autonomous machine. It shall carry its own power source, actuators and overall command and control system.
- A robot is only allowed to communicate with the localisation beacons (if the beacons are used during the match)
- During the match no remote controlled action is allowed: a robot shall be strictly running on its own.

### 4.2. Visibility

The referee committee encourages the team to make visible the interior parts of their robot and particularly the balls' storage sections.

### 4.3. Limitations and safety issues

#### 4.3.1. Fair-play

The aim is to share a friendly time and play as many matches as possible. Therefore, any action not directly related with the match spirit as laid out in this document and harmful for match development will be penalised. The goal of the match is not to prevent the other robot from playing.

In this spirit, robots shall not follow strategies that may for example lead :

- to prevent the opposing robot from reaching the balls or to lock the opposing robot in an area of the playing area.
- to jam the opponent robot, or to block it on a playing field item.
- to use accessories, colours or drawing looking like the form of playing area elements in an attempt to lure the opponent robot.
- to cause intentional damage to the opponent robot, the playing area, or any of the playing field elements.

#### 4.3.2. Safety

- The robots should not have any protruding or sharp parts that may be able to inflict damage or that can be dangerous.
- The use of liquid products, corrosive products, pyrotechnics materials or living beings is forbidden.
- All the systems taken aboard the robots, shall respect the law. Specifically, the systems used shall comply with legal safety regulations and must not endanger the participants or the public both during matches and backstage (see also §8.8).

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As a general rule, any device or system considered as potentially dangerous by the referee will be rejected.

### 4.4. Mandatory equipment

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The robots must obligatorily accommodate :

- A starting device : This starting device shall be easily accessed on the robot. It shall be triggered by pulling a cord of at least 500 mm long. This cord shall not remain attached on the robot after it has been started. Any other systems (remote control, manually activated toggle switch, etc) will not be approved.
- An emergency OFF button. This one shall bear a distinctive sign, at least 20mm diameter (for example a safety button). This button shall remain within the dimensions of each robot. It shall be placed in a conspicuous position in a zone that is not dangerous and that is immediately accessible to the referee at any time during the match, on the top of the robot. This emergency button shall power off the supply of the robot's propulsion and actuators.
- Each robot shall accommodate a timer which shall stop the robot automatically at the end of the 90 seconds match.

### 4.5. Recommended equipment

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The teams are strongly recommended to equip their machines with a bumper. The bumper shall be contained within the dimensions of the robot. The bumper is intended to prevent sometimes inevitable damages after unintentional collisions between robots during a match.

### 4.6. Robot spatio-temporal limitations

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- The teams are allowed to set their robot with deployable mechanisms. If such mechanisms are used, the robot shall typically unfold them after the match start signal.
- The perimeter of the robot is defined as the convex envelope which fits the vertical projection of the robot on the ground (see following figure).
- The perimeter of the robot, in the starting position, shall not exceed 120 cm.
- The perimeter of the robot in a fully deployed configuration shall not exceed 140 cm at any time during the match.
- The height of the robot shall not exceed 30 cm, excluding the beacon supporting mast (cf. §4.10) . Those limits apply during deployment movement as well.
- A robot shall be understood as a set of objects mechanically linked together (then a robot cannot disperse parts or elements on the playing area).

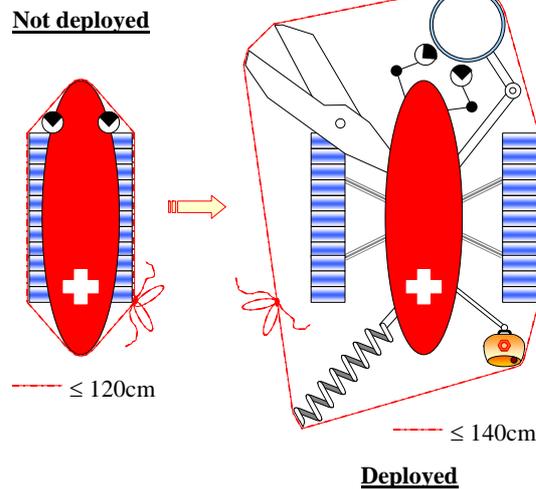


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Example of the perimeter rule.



## 4.7. Balls

The teams are authorised to take up to 14 balls (white or black) aboard their robot. Those balls must remain, within the robot size limits defined in §4.6. The referee will check up during the approval that the robot can't contain more than 14 balls. This is a physical and spatial limitation.

## 4.8. Energy sources

- All types of energy sources are allowed (springs, pressurised gas, solar cells, batteries, etc) except for those using corrosive products or pyrotechnics products.
- With respect to batteries, it is requested to use only models with solid electrolyte in order to prevent any problem in the event of an acid leakage.
- It is strongly recommended for teams to possess several battery sets and to design for an easy access in the robot for their replacement. The teams are reminded to have spare, fully-charged batteries available at all times. The teams shall be capable of playing two matches successively.

## 4.9. Control systems

The teams may use any kind of robot control system (analog, microprocessors, microcontrollers, computers, programmable logic, etc).

Those systems must be fully integrated into the robot(s).

## 4.10. Robot localisation beacon support

- It is strongly recommended to the teams to set the robot with a support to accommodate a localisation beacon prepared by opposing teams.
- This beacon support can be dismantled and be repositioned in a very short time so that a team can use it only if the opponent needs it.



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- Finally, a team may choose not to set its robot with a beacon support. But in that case, if the opponent requires such a device, and needs it, the team will be scratched for the current match.
- The beacon support shall at anytime comply with the following constraints:
  - It shall be carried by the robot as a 80x80 mm square surface, located 380 mm above the floor level. The structure supporting this platform must stay within the vertical projection of this platform. This mast cannot host any parts of the robot other than sensors. The mast shall be robust and rigid enough to support the opponent's beacon in a stable configuration prior to its operation. The team is responsible for the robustness of its mast.
  - The platform surface of the support shall be fully covered with Velcro (catch "snaggable" face) on a 80x80 mm square surface.
  - The support shall be located at the centre of the robot as much as possible. In robot non deployed configuration, the distance between the support and the maximum robot extension on one side shall not be less than 50% of the equivalent distance on the opposite side.
- The support shall be able to support also a flag module identifying the robot allocated colour (see §6.1 for details).

## 5. Beacon

### 5.1. Generality

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- Beacons are meant to help robots to locate themselves on the playing area, to locate the opponent robot on the playing field or other playing fields items.
- Beacons are not allowed to obstruct the opposing robot. If there is any doubt that they may deliberately disturb the development of the match, the team won't be allowed to use it
- Three fixed beacon supports are placed each end side of the playing area: one at the centre, the two others on each corner (see the drawing in the appendix). Their platform is placed 300mm above the playing area. The supports are painted in black.
- The use of beacons is optional and they shall be designed and built by the teams.

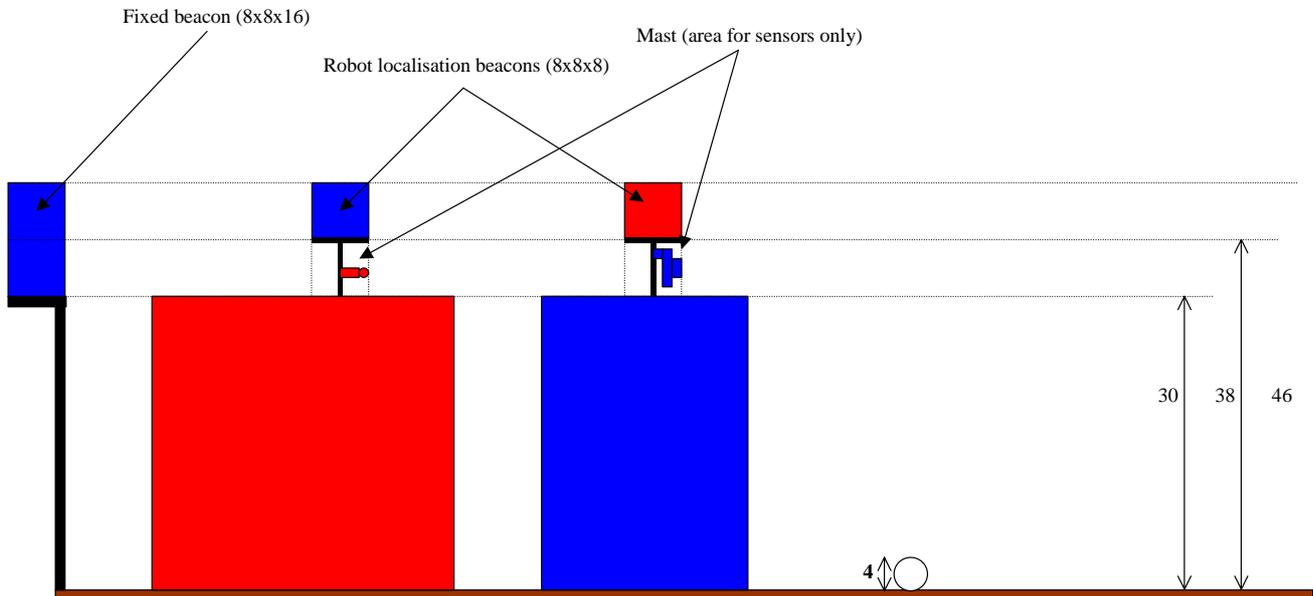




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all dimension in Centimetres

## 5.2. Robot localisation beacons

- One localisation beacon can be fitted onto the other robot, in order to locate it. This beacons will be fitted on the beacons support provided for this purpose by the opponent robot.
- Only one localisation beacon is allowed per team.
- The robot localisation beacons shall be fully autonomous and independent.
- The maximum size for a robot localisation beacon is an 80mm edge cube.
- The elements used for the beacon design shall be useful (no load or similar dummy). The referee may request if necessary that the team opens its beacon casing for inspection and verification.
- The robot localisation beacon top shall be able to support the flag module identifying the robot allocated colour (see §6.1).

## 5.3. Fixed beacons

- Each team can use a maximum of three beacons, to be placed on the provided supports around the playing area.
- A team can place its beacons on the beacons support which is in the middle of his starting area and on the 2 beacons supports which are in the other side of the playing area, at the two ends of it.
- Beacons have to be autonomous. Only the 2 beacons on the same side can be linked together by a wire. This optional wire shall not disturb the development of the match.
- Those beacons must remain within a square base of 80x80 mm and can be 160 mm high.





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## 5.4. Design requirements

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- The beacon underneath surfaces shall be covered with Velcro (soft "smooth" face) as a way to fasten them on their assigned support.
- The beacons (robot localisation or fixed ones) shall remain on their support throughout the matches.

## 5.5. Communication signals

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- In order to avoid interference between the teams, it is recommended to encode the communication signals. We strongly recommend that teams using infrared devices take into account the strong ambient light used during the competition. Moreover, this illumination may vary during the competition depending on the time and on the area.
- We also mention that the competition staff use H.F. devices during the contest.
- No protest will be taken into account regarding interference problems. The machines must be able to cope with the conditions that may change depending on the moment and their location during the contest.

# 6. Match timeline

## 6.1. Robot identification

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- For each match, the robots are allocated with a colour marking built as a small flag module: red or blue. The use of this marking is to help the public to associate at any instant a robot with its team.
- The flag module mass is negligible. It is placed directly on the robot beacon support, or directly on the robot (see §5.2 with respect to the possible absence of a beacon support on the robot) and on the fixed beacons.

It is requested from the team to provide a flat surface, set with Velcro ("snaggable face") support this on its robot (typically the beacon support) and the beacons (either fixed or mobile).

## 6.2. Start procedure

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- A colour (red or blue) and a side of the playing area are allocated to the team before each match.
- Each team shall position its non-deployed robot in the playing area. The robot must be in contact with the playground small side border where it is painted (in blue or red: in blue for the robot represented by the blue colour and in red for the robot represented by the red colour). The entire robot has to be in front of the painted border.
- The robot mustn't contain any balls at the beginning of a match. A robot which is containing balls will be scratched.
- Only two people from the teams are allowed access to the playing area for the robot preparation.

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- Teams have 3 minutes to put their robot on the starting position.
- Then, as the robot is on the playing area, no more intervention or transmission of external information is allowed.
- When both are ready, the referee will toss for a random position for the totems and then place the 2 white balls in the 2 empty places. Then the referee will toss for a random position for 2 black balls and places them. The 2 other black balls are positioned with a central symmetry. During this process, the teams cannot touch their robot.
- The referee asks the participant whether they are ready and if they have any remarks about the placement of all the game elements. No objection regarding the placement will be accepted beyond this last moment.
- At the start signal given by the referee, the robots are activated by one of the team members. The robot shall then run on its own in a fully autonomous way.
- Any team, which does not scrupulously follows this starting procedure (anticipated or delayed start), is charged with a false start. A new start shall be given with a new random layout for balls and totems. The referees reserve the right to start the robots themselves.

## 6.3. Match sequence

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- Robots have 90 seconds to get as many points as possible. This must be accomplished in complete autonomy.
- The team members are not allowed, in any way, to touch the robots, the playing area or any of the fixed game elements during a match. Any action made without the referees consent will lead to the teams elimination for the current match. The team will then lose all the points it may have scored during the match.
- If the robot leaves the playing area, it can't be put back into it. The match continues without being played again. However, a robot can't deliberately push an opposing robot out of the playground.
- At the end of the match, the robots will stop, using their timers. If the timer does not work properly, the emergency stop button will be used by the referee to stop them.
- The referees will count the points without touching the robots. Then they will announce the scores.
- The team members are allowed to touch the robots and leave the scene only with the explicit referee's consent after a common agreement on the announced score, and only when robots don't contain any balls.

## 6.4. Score calculation

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### 6.4.1. Points

- The points count is made when the match is over.
- Each white ball inserted in a hole encircled with the colour representing one team gives one point to this team.
- Black balls don't score.
- After the end of the match, the white balls that may enter in the holes don't count.

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### 6.4.2. Penalties

A penalty is associated with the removal of one point to the team score at the end of the match. Any robot whose action is not compatible with the rule spirit, may be penalized by the referees.

The referee may assign a penalty for example in the following cases:

- a robot violently running into the opponent robot;
- a robot considered dangerous with respect to the table and/or the opponent robot;
- a robot that blocks the opponent robot on a playing field item.
- a robot which timer doesn't work

Warning: this list is not exhaustive. Other penalties can be allocated when the referee considers this justified.

### 6.4.3. Scratching

The referees will scratch a team:

- that has not come on time at the backstage waiting room for matches;
- that takes more than 3 minutes to get ready on the playing area;
- whose robot has not completely crossed the nearest black line painted on the playing area.
- whose robot doesn't have a mobile beacon support, when its opponent requests and requires one.

In addition, the referees may scratch a team:

- Whose robot shows a deployment or an action that has not been previously approved by the referees, or any deliberate action not in line with the rules.

A team being scratched during a match loses all the points gathered during this match. The opposing team carries on with the match and keeps its points.

## 7. Contest master timeline

### 7.1. Approval

To participate to the qualification rounds, a robot shall be controlled by a referee who checks:

- That the robot complies with the rules: for this purpose, the robot shall be capable of showing all of its possible actions and deployments.
- That under match conditions, free of an opponent :
  - The robot has crossed the nearest black line painted on the playing area.
  - The robot is able to win a match (it puts at least one white ball in their hole in 90 seconds).
  - The robot is equipped with an automatic stop timer that works properly.
- That the team provides a technical file (see appendix).

A robot which satisfies these criteria will be approved.

N.B.:

- It is mandatory to keep referees informed of any major modifications (functionality, size, etc) made after approval and between matches. The referees will check that the modifications do not impede the robot compliance to the rules. If the control is successful, the referee will revalidate the approval.





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- A deployment or an action, which has not been approved and is used during a match, will lead to a scratch of the robot for the current match.
- At any time during the competitions, and in the event of a doubt over a robot, the referees have the right to proceed with a new approval.
- For example, any robot which repeats a non fair play act for several matches will be asked for correction/amendments and for a new approval.

## 7.2. Qualification rounds

The number of matches in a qualification round depends on the organizer of the national cup. The Eurobot organization encourage them to propose five matches at least during the qualification rounds. The qualification round result decides which teams are qualified for the final round.

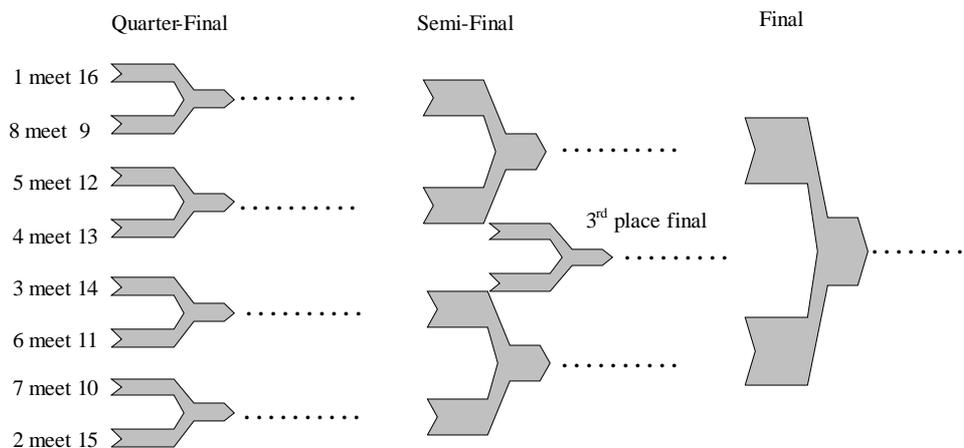
The qualification score is determined by adding the points accumulated during each match with bonus points:

- 4 points for a victory,
  - 2 points for a draw,
  - 1 for a defeat,
  - 0 for a scratched match.
- A 0 to 0 score is considered to be a double defeat. Hence, each team gets 1 bonus point.
  - When the qualification rounds are over, the teams are sorted using their qualification points count. The teams that have the same points count are sorted by comparing the points accumulated during each match without adding the bonus points. The organisers may, if necessary, request extra matches.

## 7.3. Final round

The first 8 or 16 teams from the qualifying phase (depending on the number of registered teams) are selected for the final round.

The matches for the final round are organised according to the principle shown below:





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## Rules... Rules... Rules... Rules... Rules... Rules...

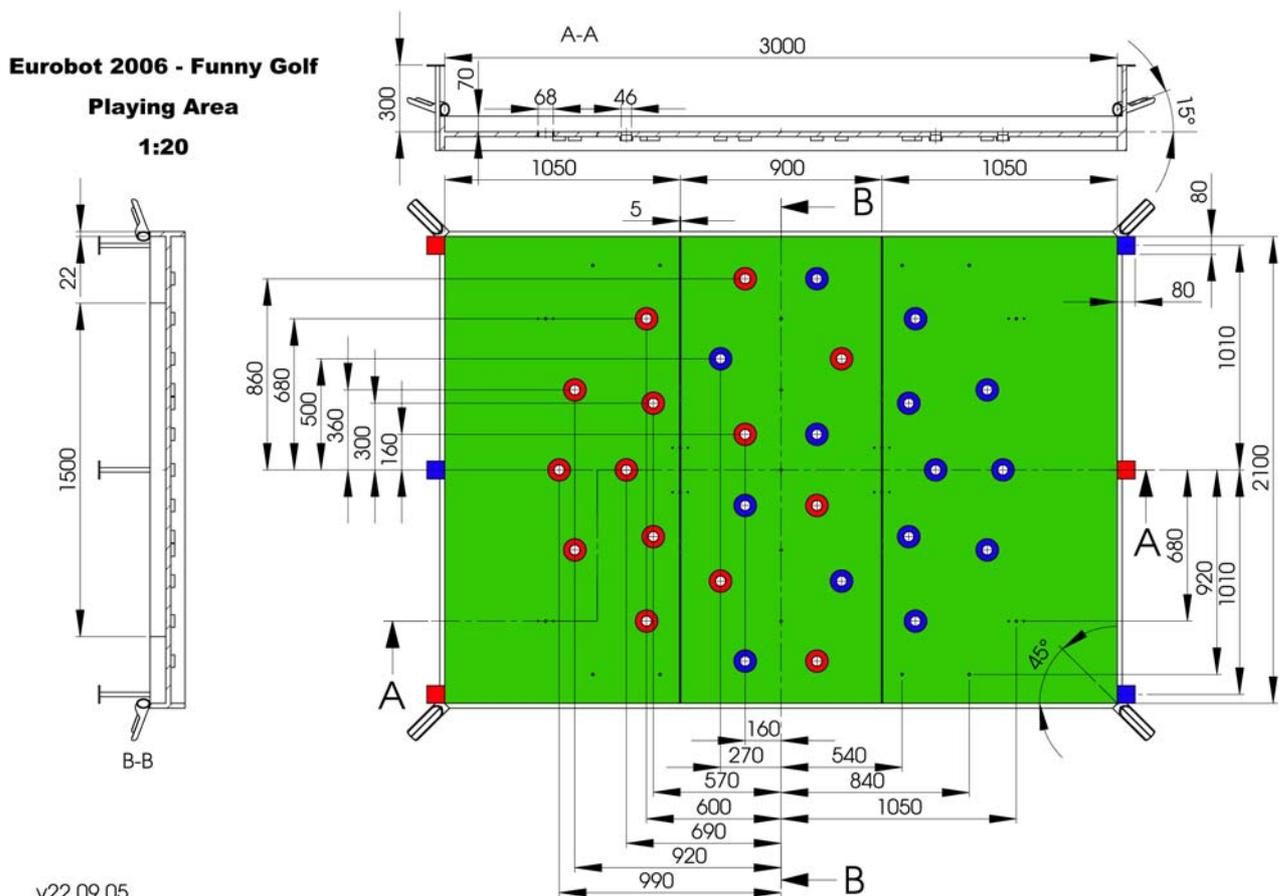
- During the final phase, matches are on a knockout basis.
- In the event of a double defeat, of a draw or double withdraw, the match is replayed immediately. If this second match is also a double defeat, a draw or a double withdraw, the winner will be determined from points gained at the end of the qualification rounds.

## 8. Appendixes

### 8.1. Playing area drawing

Dimensions are given in mm and are subject to the general tolerances defined in §3.1.2.

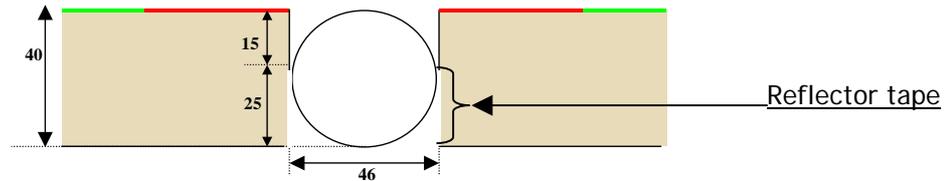
The playing area: above and side views



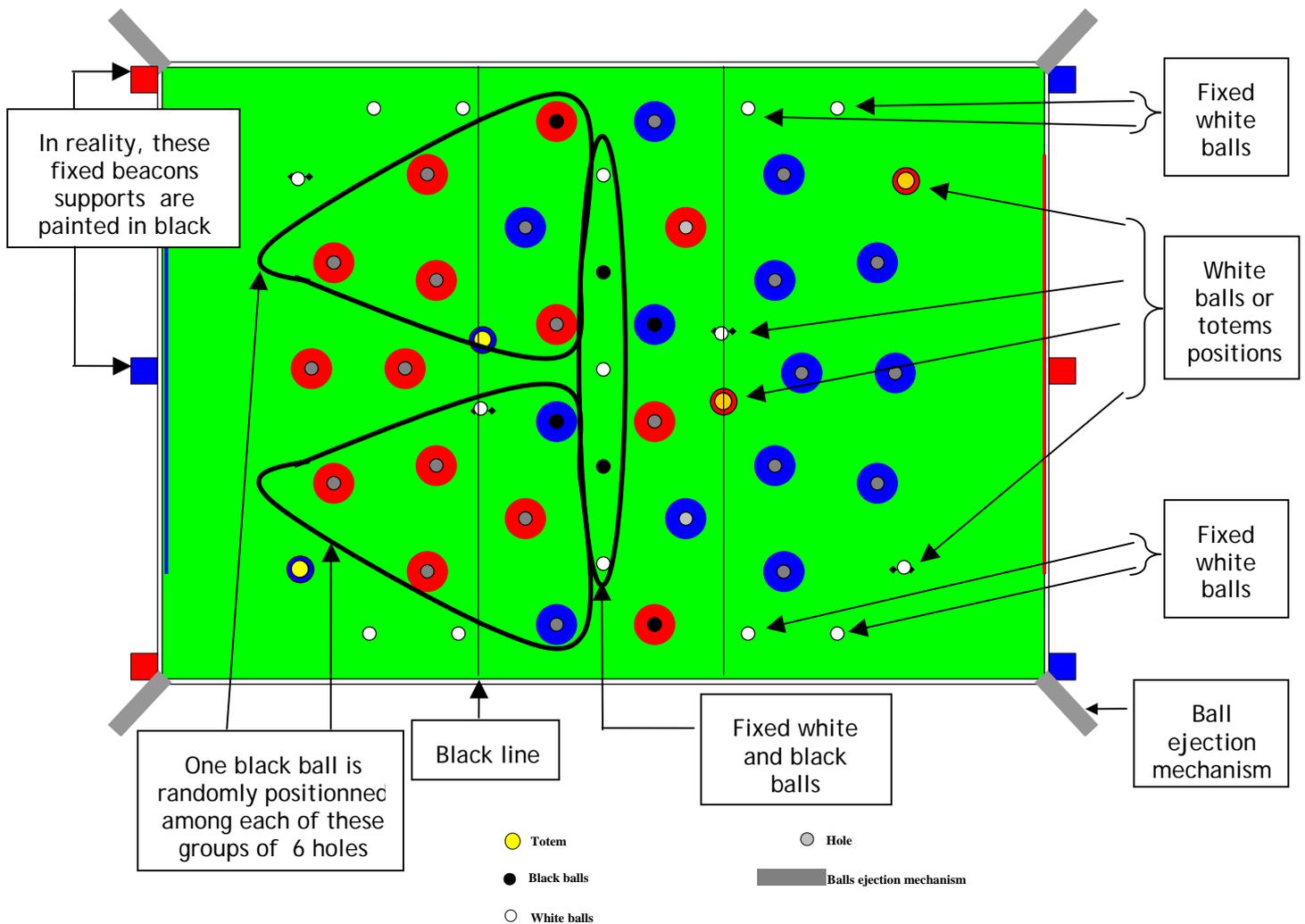
## Rules... Rules... Rules... Rules... Rules... Rules...

➤ Reflector:

This is made of an adhesive retro reflector tape, 0.2mm thick, 25mm wide, white colour. Its reference is XUZB05 from "Telemecanique". The tape is distributed on line by the RADIOSPARES (RS) company under reference 324-1591 (1m).



## 8.2. Playing area layout

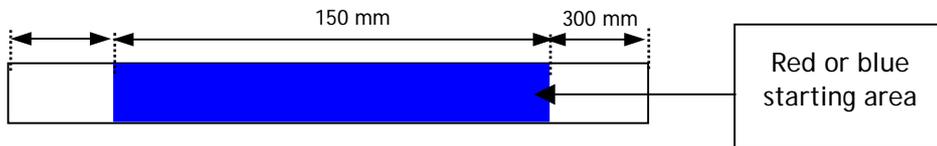


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Border :

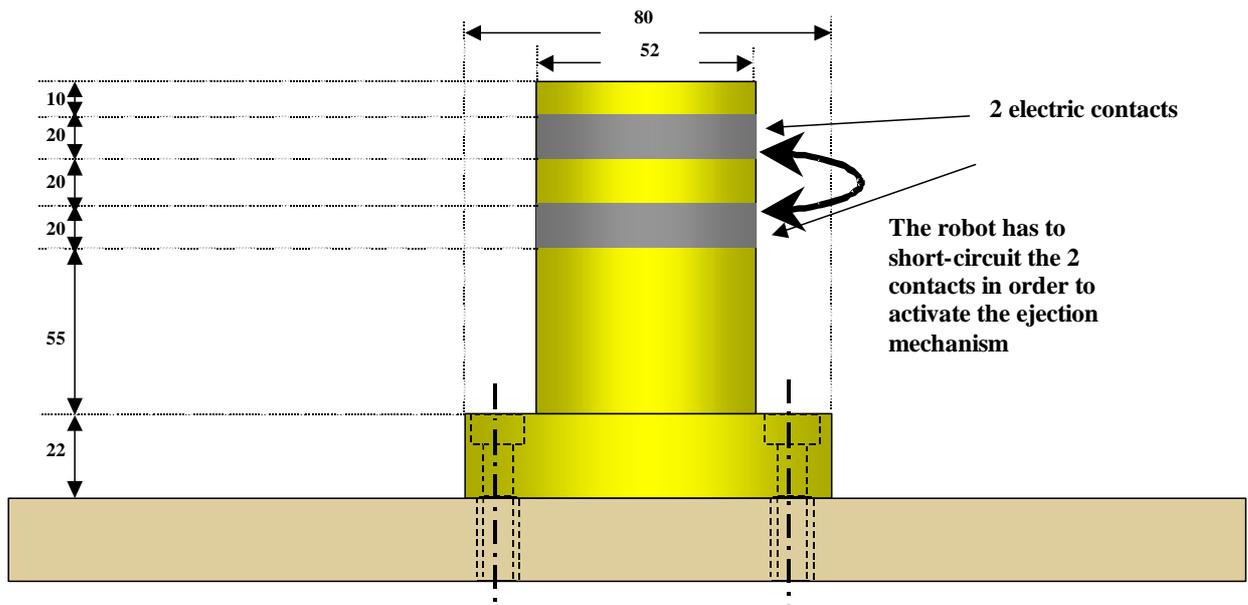


### 8.3. Balls

Balls are table tennis balls and only balls agreed by ITTF (International Table Tennis Federation) are allowed (listing at : [http://www.ittf.com:80/itf\\_equipment/Balls.asp](http://www.ittf.com:80/itf_equipment/Balls.asp)).

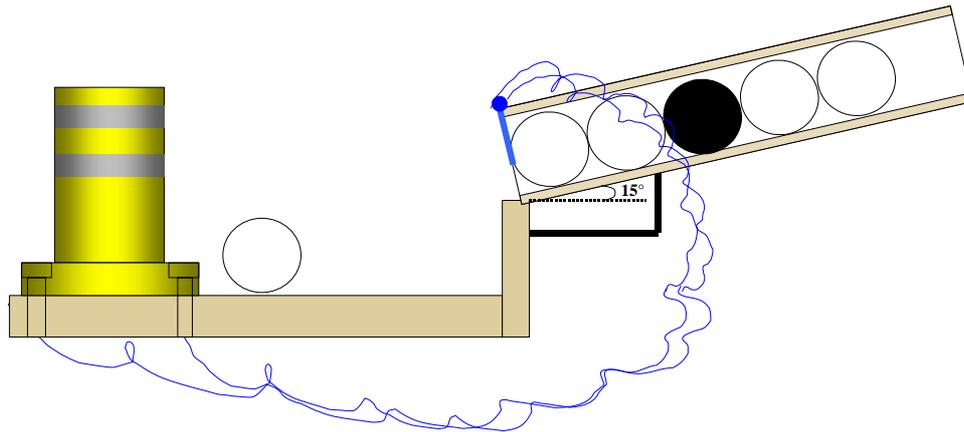
The white balls are white tennis table balls. The black balls are white tennis table balls painted in black with india ink.

### 8.4. Totem



Rules... Rules... Rules... Rules... Rules... Rules...

## 8.5. Ball eject mechanisms



## 8.6. Painting references

Element	Colour	Paint type	Reference
Totems	Zinc yellow (satin finish)	Acrylic	RAL 1018
Black balls	India ink	-	-
Playground : floor	Green (mat finish)	Acrylic	RAL 6032
Playground : black lines	Traffic Black (mat finish) or black marker	Acrylic	RAL 9017
Playground : blue circles	Sky blue (mat finish)	Acrylic	RAL 5015
Playground : red circles	Fire red (mat finish)	Acrylic	RAL 3000
Playground : holes	Traffic Black (mat finish)	Acrylic	RAL 9017



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## 8.7. Technical file

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In order to get approved, each team is required to provide a technical file during the approval phase. This file shall present the major information related to the design of the robot (drawings, technical references, design specification, etc) on an A1 format poster. This file is intended to promote exchanges and communication between teams.

This technical file must be easy to understand for most people (several drawings, simple explanations, etc). The file shall include:

- the name of the team;
- the number of team members;
- the presentation of a design, innovation, new strategy developed by the team for the robot, or any detailed design that the team is especially proud of.

This poster will be displayed in the pit of the team backstage. The poster will be written in the team mother language and if possible, in English.

A similar document will be provided as a « ppt » (Microsoft PowerPoint), « pdf » (Adobe Acrobat) or « jpg » or « png » (image) format files (« pdf » is the best). In any case, the chosen resolution should guarantee texts to be readable. The maximum file size shall remain below 10Mb.

The electronic version can be used for presentation on the Eurobot web site, and archived in the Eurobot project data base.

This document may be sent beforehand to the National Organisation Committee or provided at your arrival at the competition.

## 8.8. Safety instructions

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Below you will find a list of safety instructions to comply with. This list is not exhaustive, and may be subject to legislation modifications or national variations.

As a general rule, the teams shall develop systems that satisfy design and manufacturing criteria that do not endanger the team or the audience both in the pits and during the matches.

This is why you shall ensure that your systems comply with the applicable legislation.

### 8.8.1. On-board voltage

All robots must comply with the legal standards concerning "low voltage". Therefore, the internal voltage of the robots shall not exceed 48 V.

### 8.8.2. Compressed-air systems

All pressure systems must comply with the applicable law. In France, this shall be in accordance with the "Conseil Général des Mines" (French safety and approval board).

Reminder of Decree 63 of January 18, 1943 and Ministerial Order of July 25, 1943 (French legislation):

- Maximum pressure: 4 Bars
- Maximum Pressure x Tank Volume product: 80 bar It.

Further information may be found on:

<http://www.industrie.gouv.fr/sdsi/> (for France)





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## Rules... Rules... Rules... Rules... Rules... Rules...

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### 8.8.3. Lasers

Max output power for lasers shall be lower than 1mW (0dBm). Technical document of the laser may be asked for the approval.

### 8.8.4. Powerful light

In the event of a high intensity power source being used (by beacons for example), the light intensity shall not be considered dangerous for the human eye in case of direct illumination. Note: this may be the case with some powerful light emission diode.

