



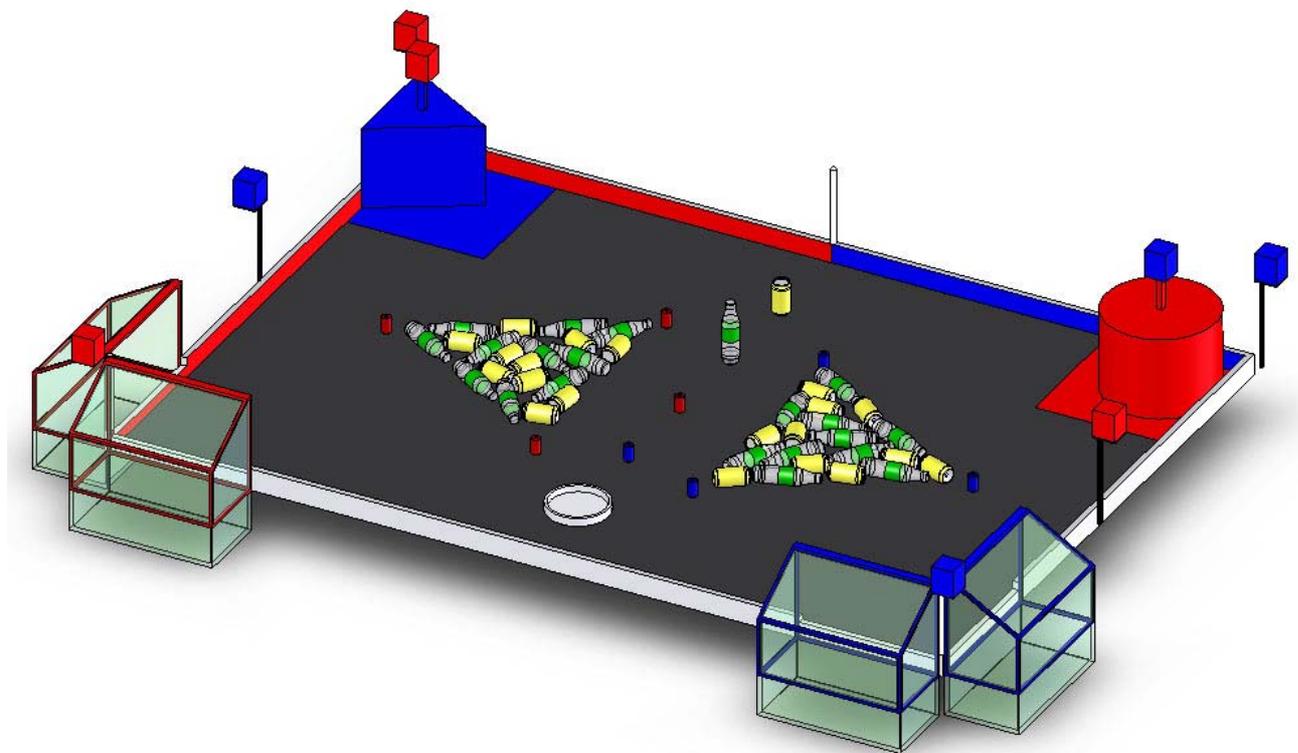
Eurobot^{open} 2007

Robot Recycling Rally



Official Rules 2007

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Waste, Sort & Win!

The robot which sorts the most waste into correct bins will be the winner.

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1. Scope

The following game rules are applicable to all the national qualifications and the final of EUROBOT 2007 autonomous robot contest.

EUROBOT is a amateur robotics contest open to world-wide teams of young people, organised either in student projects, in independent clubs, or in an educational project. A team is composed of several people. . A team must be made up of two or more active participants. Team members may be up to (including) 30 years old, each team may have one supervisor for which this age limit does not apply.

The contest aims at interesting the largest public to robotics and at encouraging the hands on, group practice of science by young people. EUROBOT and its national qualifications are intended to take place in a friendly and sporting spirit.

More than an engineering championship for young people, EUROBOT is a friendly pretext to free technical imagination and exchange ideas, know-how, hints and engineering knowledge around a common challenge. Creativity is at stake and interdisciplinarity requested. Technical and cultural enrichment is the goal.

Participation to the competitions 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 the matches). The referees' decisions are final and may not be challenged, unless an agreement is reached between all the parties involved.

EUROBOT is a contest taking place in Europe, but is open to other countries. The countries presenting more than three teams shall organise a national qualification (or national cup), in order to select three teams among 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 competitiveness 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.

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

The happy selected teams during the national robotics cups of Algeria, Austria, Belgium, Czech Republic, Germany, France, Italy, Roumania, Serbia, Spain, Switzerland, United Kingdom and any 2007 new selection will meet their international counterparts in May 2007 from Thursday 17th to Sunday 20th, in La Ferté-Bernard (France) to compete for the EUROBOT final.

EUROBOT is born in 1998, in the wake of the French Cup of Robotics, following the constitution of a similar competition in Switzerland. Today, to stand with the international spreading of the contest, and to structure the spirit of exchange and co-operation that exists between the different organisers, all have gathered into a European association.

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The association, officially born on May 2004, is named EUROBOT. You can find its statutes on our website: www.eurobot.org. All individuals and structures sharing our values are very welcome, either to support, or join as volunteers in the different organising groups.

It shall be noticed that most of the national qualification 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 noticed that multinational teams are welcome.

EUROBOT and its national selections are attended mostly by volunteers of all nationality who believe in the educational value of the experience, and are for most former participants themselves.

Welcome!

And have a nice adventure!

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2. Basic rules

The following rules are applicable to the Eurobot Open 2007 autonomous robot contest. It is expected that the national qualifications will conform to most of these rules. However, participants in every specific country are advised to check with their National Organization Committee for differences.

This year, the robots are sorting waste. There are three kinds of waste to find: bottles, cans and batteries. Only one robot is allowed per team in a match. The matches involve two teams and last 90 seconds.

Each team is associated with a colour, red or blue. Each team has two bins: one for bottles and one for cans. In addition, there is one, shared, basket for the batteries.

Each robot finds some garbage on the table, transports it to the correct bin, deposits it, and returns to look for some more garbage.

2.1. Referees

Each match will be overseen by two referees. For the finals, at least one of the two referees will be from a country different from both of the competing teams.

The referees are intended to help the teams, as well as interpret and apply the rules during the competition and approval phase. Teams are encouraged to contact the referees with questions about the rules or the competition process.

3. Playing area and element definition

3.1. General notes

A reference of parts and products used to make the game components is included in an appendix at the end of this document.

3.1.1. 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.

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

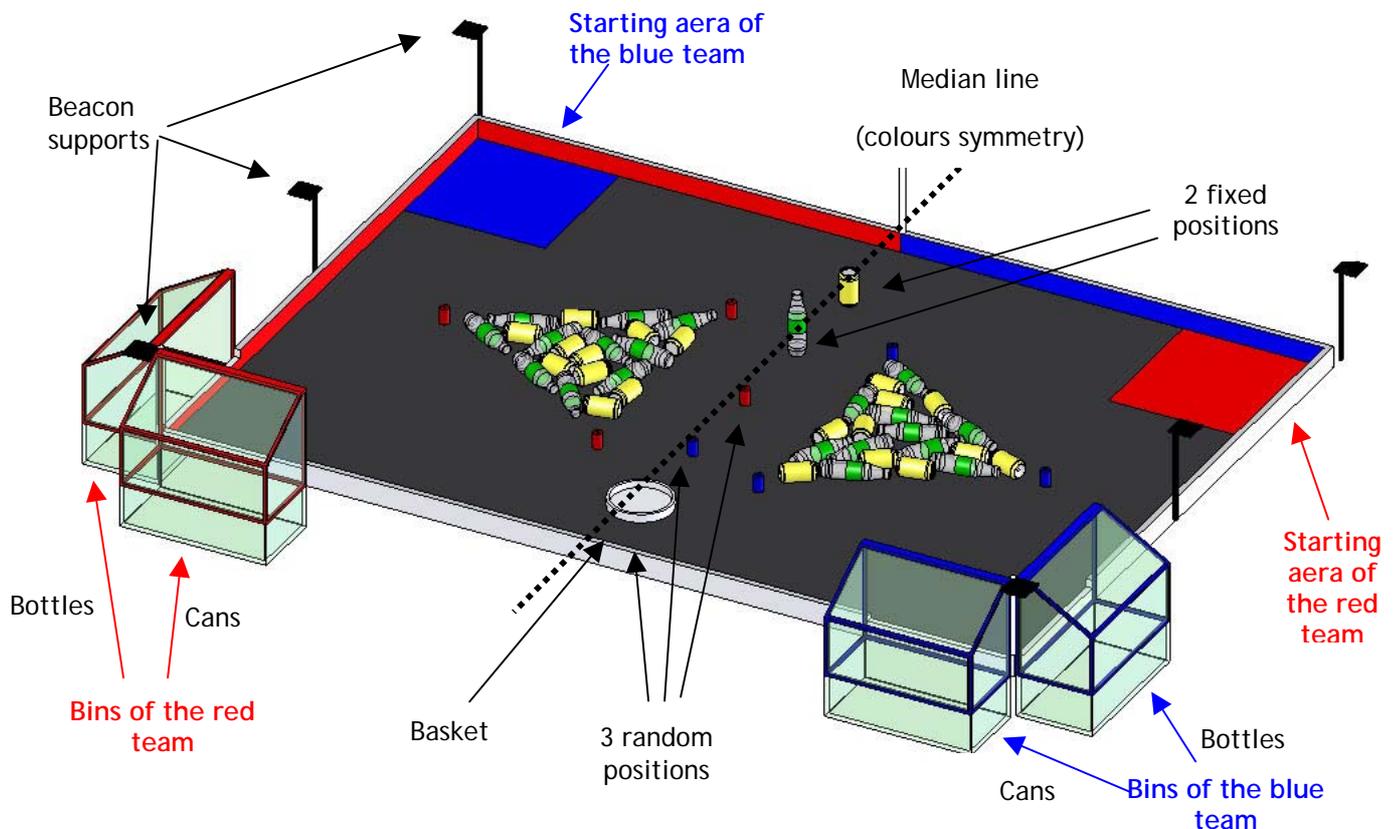
The teams are warned that the paint finish of the table may vary from one playing area to another and may degrade during the competition.

As we discover problems with the rules, the definition of the field and game components may be modified over the course of the year. We strongly advise participating teams to regularly consult our web site www.eurobot.org in the 'FAQ' section for potential amendments.

Please note: the above tolerances apply to the playing field and other components of the game. Robots and the localisation beacons prepared by the participating teams may be required to be more precise.

3.2. The playing area

The playing field is 210 cm wide and 300 cm long. It is painted in grey anthracite. There are 4 bins and one basket for depositing the waste. Each robot has 2 bins, one each for cans and bottles, at one corner of the table. There is also a basket for the batteries. This is placed randomly and fixed to the table at the start of the match, and is used by both robots for depositing the batteries.





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3.3. Starting Areas

The starting areas are on the corners of the table opposite the bins. Each starting area is a square of 500mm sides in the respective team's colour (red or blue). The robots are placed touching the two borders on either side of their start areas at the beginning of the match.

3.4. Border

The border is 70mm high (above the table level) and 22mm wide. The border in front of the bins is slightly lower, 50mm for the can bins, and 40mm for the bottle bins.

The border is half painted in blue and red (symetrically, with the boundary in the middle of the long side). The blue bins and red start-area are on the blue side, and the red bins and blue start-area are on the red side.

3.5. Beacon supports / Reflectors

At each of the four table corners, and in the middle of the short sides are installed beacon supports for the localisation beacons (see the table plan).

The beacon supports consist of an 80mm square platform supported 350mm above the table surface. The platform is covered with Velcro ("snaggable" or "hard" side).

The beacon support mast is 10mm wide, painted black.

Cylinders about 22mm in diameter and 280mm high are located in front of the two masts on the corners where are located the bins. They are covered with reflective tape (see appendix for specifications of the tape). Another cylinder with reflective tape is located in the middle of the opposite border (between the two starting areas). It is 280mm high from the border.

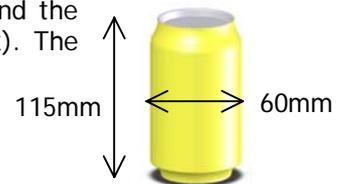
3.6. Waste / Placement of Waste

There are 50 total pieces of waste, of three types: 21cans, 21 bottles and 8 batteries.

3.6.1. Aluminium cans

There are 21 cans on the table: 20 random and 1 fixed. They are aluminium cans of 330ml volume, type sweet drinks with gas. The sides of the cans are painted yellow (RAL 1018). The tops and bottoms of the cans are left unpainted (metal). In order to improve the stability and the solidity of the cans, they are filled with polyurethane foam (see appendix). The cans are 115mm high and 60mm in diameter on the major aera.

The cans are not magnetics.



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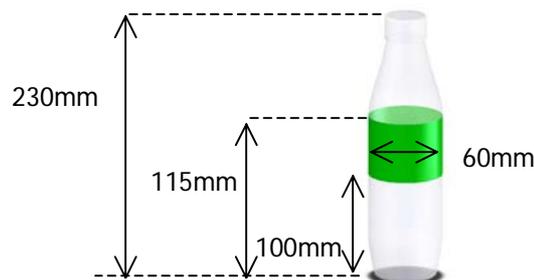


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3.6.2. Plastic bottles

There are 21 transparent plastic (PET) bottles: 20 random and 1 fixed. The colour of PET is clear but not determined. The plastic bottles are 500ml size, type sweet drinks with gas. The bottles are empty, and without caps and rings. The original label is removed and a uniform green insulating adhesive tape of 50mm wide is placed instead. The label is located between 100 and 150mm high from the bottom of the bottle. The bottles are 230mm high and 60mm in diameter at the label emplacement.



3.6.3. Batteries

There are 8 batteries, 4 red and 4 blue. Three of each color are fixed and one of each is random. The batteries are Type "D" or "LR20", 1.5V. The body of the battery is 55mm high and the positive terminal 5mm high. The batteries are discharged. Only undamaged batteries without corrosion may be used.

The original label is covered with an insulating adhesive tape of uniform colour (red or blue). The adhesive tape is 50mm wide and placed from 4mm from the bottom (the negative terminal) of the battery.



3.6.4. Placement of the waste

There are 5 equidistant positions (every 350mm) on the median line of the table: 2 fixed positions and 3 random positions. The fixed positions are for a can and for a bottle. The position nearest the starting area is for the can. The second position is for the bottle. The three other random positions are for a red battery, a blue battery and the basket. Before the match a randomly drawn card is used to determine the position of those three elements.

Another 46 waste items (20 cans, 20 bottles and 6 batteries) are placed on the table with the aid of triangular frames. First the frames are placed (see schema of the table) on each side of the table. Then, three batteries of a colour are placed inside and on every corner of the opposite triangle of the starting area. After, the 10 cans and 10 bottles are put in each frame, randomly, lain down. The side interior of this equilateral triangle is 850mm. Each triangle is at 300mm from the middle line of the table (border interior of the triangle, one face parallel to the line).

One black point indicates the localization of the three fixed batteries of each triangle, the fixed bottle and the fixed can.



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3.7. Bins and basket

3.7.1. Bins

The bins are outside the table on two corners of the table, facing the audience and opposite the robot starting areas. There are two bins at each of the two corners, 500mm long and 250mm wide. The opening of the bin is level with the table border. The bin in front (on the long side) of the table is for cans, the border of the table is 50mm high in front of this bin. The other bin is for bottles, and the table border is 40mm high in front of this bin. Each of the bins should be deep enough to potentially accommodate all the correct waste. The bins must be transparent (plexiglass, net, transparent plastic bags), so that the audience can see the contents.

The top of the bins is 350mm high from the playing area and slop down to 200mm high.

The top of the bins is covered by the same insulating adhesive tape of uniform colour and 50mm wide (red or blue) of the batteries.

3.7.2. Basket

There is a "basket", randomly placed on the middle line of the table and fixed to the table at the beginning of the match by a screw ($\varnothing 6$). The screw is at the center of the basket and determined its position. The basket is a hollow cylinder, 200mm in diameter and 30mm tall, with 10mm walls and open at the top. The interior depth is 25mm. It is white in colour. The position of the basket is indicated by the card drawn at the start of each match

4. The robots

4.1. General notes

- Each team can engage at most one robot.
- The robot is a fully autonomous machine. It shall carry its own power source, actuators and control system.
- The robot is only allowed to communicate with the localisation beacons (see beacons, below).
- During the match no remote controlled action is allowed: the robot runs strictly on its own.

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4.1.1. Visibility

The refereeing committee encourages the team to make the interior parts of their robot visible.

In the finals Eurobot, two rectangular spaces of 100x70 mm are required for stickers (numbers of the teams and sponsors of the event, printed by the organizer). The space of the stickers is free but they must appear on two different faces of the robot.

4.2. Limitations and safety issues

4.2.1. Fair-play

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

In this spirit, teams shall not follow strategies that are, for example, meant to:

- block the opponent robot's access to an element or area of the playing field
- deliberately designing the robot (colour, shape) in order to confuse the opponent robot
- deliberately cause damage to the opponent robot, the playing area, or any of the playing field elements.

In particular, none of the colours mentioned in these rules for playing field elements may be used on the robot.

4.2.2. 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, pyrotechnic materials or living beings in the robot is forbidden.
- All the systems on the robots shall respect existing national and European laws and specifications. Specifically, the systems used shall comply with legal safety regulations and must not endanger the participants or the public both during matches and backstage .
- As a general rule, any device or system considered as potentially dangerous by the referee will be rejected, and must be removed from the robot prior to competition, or result in disqualification.

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4.3. Mandatory equipment

All robots must include the following systems, or they will not be approved for competition.

4.3.1. For starting the robot

This starting device shall be easily accessed on the robot. It shall be triggered by pulling a cord at least 500mm 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.

4.3.2. Emergency OFF button

The robot must include an emergency off button, at least 20mm in diameter (for example a safety button). 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. Pressing the emergency button shall result in immediate shutdown of all the robot's actuators, leaving them limp (not actively braked).

4.3.3. Automatic shutdown

Each robot shall accommodate a system which shall stop the robot automatically at the end of the 90 second match duration. "Stop" implies complete shutdown of all actuators. Robots moving after the end of the match will be penalized or disqualified.

4.3.4. Obstacle avoidance system

The teams are required to equip their robots with an obstacle avoidance system. The system is intended to prevent collisions between robots during a match. The system is intended to react to the opponent robot. It could be realized through contact (e.g.: physical bumper sensor) or contact free (e.g.: infra-red, laser, sonar, camera) sensors. It may make use of the localization beacon (see below) placed on the opponent robot. If a bumper sensor is used, it must be sensitive enough, and the robot reaction fast enough, to reduce the impact of a collision. The obstacle avoidance system will be tested in a trial during the robot's approval.

4.4. Robot Dimensions

The teams are allowed to design 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 robots is defined as the convex envelope which fits the vertical projection of the robot on the ground.

The perimeter of the robot in its starting configuration shall not exceed 120cm.

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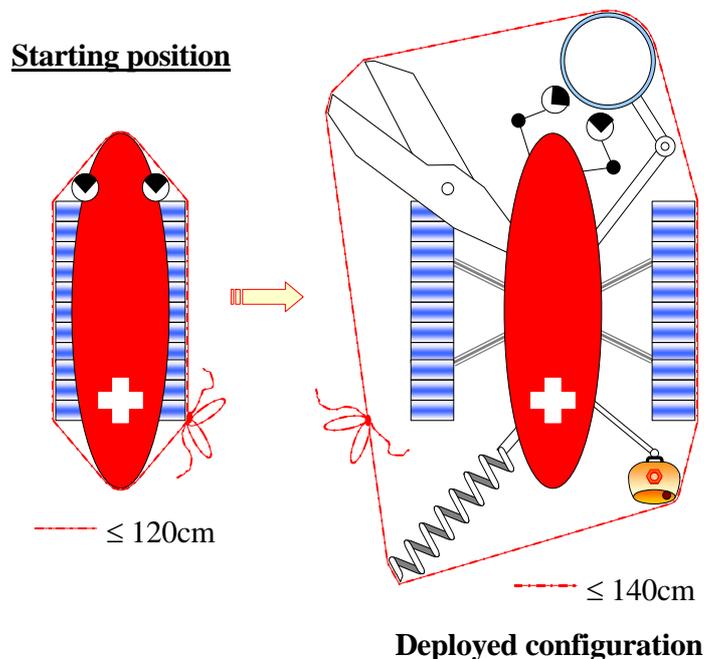
The perimeter of the robot in a fully deployed configuration shall not exceed 140cm at any time during the match.

Those perimeters are dimensions without waste.

The height of the robot shall not exceed 35cm, excluding the beacon supporting mast (see beacons, below), possible sensor equipment within the beacon support mast's envelope (see beacons, below) and possibly the pressing area of the emergency stop button.

All other systems, including mandatory systems, must be contained within the volume specified above.

All parts of the robot must remain physically connected - therefore the robot cannot leave parts of itself on the playing area.



4.5. Energy Sources

- Permitted energy sources include springs, pressurised gas (but see limits, below!), solar cells (note that the competition will be held indoors!), all types of commercially available batteries and power cells,
- Prohibited energy sources include all types of combustion engines, rocket engines, hydrogen fuel cells, or any other type of burning or pyrotechnics, living beings and radioactive energy sources of all types



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- If in doubt about your unusual energy source, ask the refereeing committee ahead of time!
- With respect to batteries use only models with solid electrolyte in order to prevent any problems with corrosive liquids
- It is strongly recommended for teams to possess several battery sets and to design for 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 in succession. Note that this includes the necessary "setup time", when the robot is powered on and waiting to start, but the match has not yet begun.

4.6. Control Systems

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

Those systems must be fully integrated into the robot.

The control system must permit the robot to play a match as either colour. Ideally, this can be easily set just before the match.

The control system must permit the robot to pass the approval phase (see approval, especially with respect to obstacle avoidance).

4.7. Robot localisation beacon support

It is strongly recommended to design the robot with a support to accommodate a localisation beacon prepared by the opposing team.

If desired, the support can be designed to be detachable, so that it is only used if the opponent needs it. In this case the design must allow the support to be quickly attached before the match.

Finally, a team may choose not to set its robot with a beacon support. In this case, if the opponent provides a beacon and wants to use it during the match, the team will be disqualified for not having the support.

The beacon support shall at anytime comply with the following constraints:

- It is a 80x80 mm square surface, located 430mm 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 fashion. The team is responsible for the robustness of its mast.
- The platform surface of the support shall be fully covered with Velcro ("snaggable" or "hard" face)

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- The support shall be located close to the horizontal centre of the robot. 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.

4.8. Technical poster

Each team is required to provide a technical poster during the approval phase.

This poster shall present information related to the design of the robot (drawings, technical references, design specification, etc.). It should be at least DIN A1 in size, and ideally should be printed. The poster is intended to promote exchange and communication between teams.

Effort should be made to make the poster understandable to a technical audience. Ideally the poster should include pictures and diagrams to help explain the concepts.

The poster must also include:

- the name of the team
- the names of the team members
- the nationality of the team

This poster will be displayed in the team area of the competition. An English version of the poster must be supplied. Optionally, the team can provide other language versions as well.

The poster shall be supplied to the Eurobot association in PDF Format. The chosen resolution of the PDF must guarantee all texts to remain readable. The file size of the PDF should remain below 10MB.

The team explicitly confers all rights to the Eurobot organization to use the poster, in whole or in part, in any way desired. In particular, but without being limited to this, the Eurobot organization will publish the poster on its website, and may use it for marketing purposes. The team is responsible for ensuring that it has the rights to all graphics and texts used in their poster.

The PDF Version of the poster may be sent to Eurobot beforehand via your National Organisation Committee, or may be provided on two CD-ROMs at the competition, during the approval for your robot.

5. Beacons

5.1. General Comments

- Beacons are meant to help the robot to locate itself on the playing area and to locate the opponent robot's position

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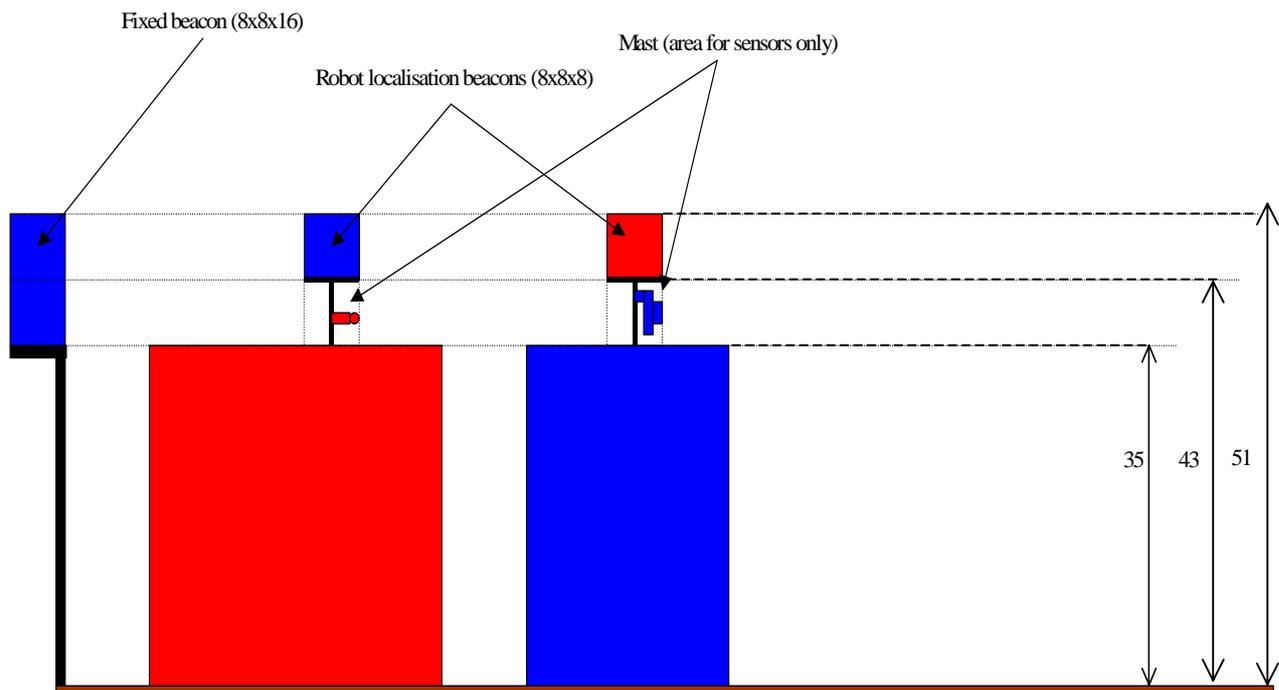
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- Beacons are not allowed to obstruct the opposing robot (communication, weight...). If there is any doubt that they may deliberately disturb the development of the match, the team will not be allowed to use them.
- Three fixed beacon supports are placed each end side of the playing area: one at the centre, the two others on each corner (see the drawing in the appendix). They are black and placed at a height of 350mm above table level. The masts of the beacon supports are round, 10mm in diameter, and covered with reflective tape (see appendix).
- The beacons' undersides are 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.
- The use of beacons is optional and they shall be designed and built by the teams.
- All safety standards applicable to robots are also applicable to the beacons.



all dimension in Centimetres

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5.2. Robot Localisation Beacon

- One localisation beacon can be fitted onto the other robot, in order to locate it. This beacon will be fitted on the beacon support provided for this purpose by the opponent robot.
- Only one localisation beacon is allowed per team.
- The maximum size for a robot localisation beacon is an 80mm edge cube.
- The elements used for the beacon design shall be useful. 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.

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.
- 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.
- The beacons must remain within a square base of 80x80 mm and can be 160 mm high.

5.4. Communication signals

- 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 uses high frequency radio devices during the contest.
- No protest regarding interference problems will be taken into account. The beacons must be able to deal with the conditions that may change depending on the moment and their location during the contest.

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6. Match timeline

6.1. Robot identification

- For each match, the robots are allocated 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 chapter about the beacon support).
- If the robot does not provide a beacon support, it must provide a 8x8cm square surface covered with Velcro at the top of the robot to place the flag marker on.

6.2. Start procedure

- A colour (red or blue) and therefore a side of the playing area are allocated to the team before each match.
- Only two members from each team are allowed access to the playing area for robot preparation.
- Both teams have 3 minutes to put their robot on the starting positions, they do this concurrently.
- The robots are placed on the table, entirely within their starting areas, and touching the two table borders adjacent to the starting area.
- After the 3 minutes of preparation, no more intervention or transmission of external information to the robot is allowed.
- When both teams indicate they are ready, the referee will determine random positions for the two batteries and the basket. This is done by drawing from a set of cards. The referee set the elements on the playingfield area. During this procedure, the teams don't have the right to touch their robot.
- The referee asks the participants 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 after this.
- At the start signal given by the referee, the robot is activated by one of the team members. The robot shall then run on its own in a fully autonomous way.

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- Any team which does not scrupulously follow 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 the game elements.
- The referees reserve the right to start the robots themselves.

6.3. Match sequence

- Robots have 90 seconds to score as many points as possible. This must be accomplished in complete autonomy.
- It is prohibited to remove garbage from the bins.
- 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 disqualification 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 in it. The match is not replayed and the other robot is allowed to finish the match normally.
- A robot that deliberately pushes its opponent out of the playing area is disqualified.
- At the end of the match the robots must stop (shutdown of all actuation) by themselves. If the robot does not shut down by itself, a referee will push the emergency stop button to stop the robot.
- The referees will count the points without touching the robots. Then they will announce the score.
- The team members are allowed to touch the robots and leave the game only with the explicit consent of the referees after common agreement on the score.

6.4. Score calculation

6.4.1. Points

Points are counted after the match is over. After the match, the waste in the bins and the batteries in the basket are checked.

- For the correctly sorted waste:
Each team gets one point for each bottle in its bottle bin.
Each team gets one point for each can in its can bin.

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- Incorrectly sorted waste is handled as follows:

The first four incorrectly sorted waste items give no point, because a bad sorted bin is not accepted by a recycling company. Each additional incorrectly sorted waste item beyond the first four items counts one point for the opposing team.
- Each battery in the basket gives three points for the team of its colour.

6.4.2. Penalties

A penalty results in the removal points from the score of the team at the end of the match. Any actions not complying with the spirit of the rules may be penalized by the referees. For example, the referees may assign penalties in the following cases:

- When a robot violently collides with its opponent
- When a robot is considered dangerous to the table, the audience or its opponent
- When a robot deliberately prevents its opponent to reach a game element
- If a robot's shutdown system fails to work
- If a robot intentionally or systematically throws waste outside of the table
- If a robot removes waste from its opponents bins

Warning: this list is not exhaustive! Additional penalties can be applied if the referees consider 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 left the starting area.
- Whose robot doesn't have a mobile beacon support, when its opponent requests and requires one.
- 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.

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7. Contest main timeline

7.1. Approval

To participate in the tournament a robot must be approved. Approval is mandatory. For logistical reasons, and reasons of fairness, there is a deadline for approval. All teams must approve their robots before this deadline. Robots that are not approved may not participate in the tournament.

To be approved, the robot must pass two tests: a physical examination and practical trials.

7.1.1. Physical examination and team interview

The referee examines the robot and interviews the team to check the following:

- That the robot complies with the rules (the robot should be capable of demonstrating all of its possible actions and deployment configurations to help verification).
- That the team provides a technical file (see paragraph 4.8).
- That the team understands the rules and the spirit of the tournament
- That the emergency stop button works, and all actuators are shut down when it is pressed

7.1.2. Practical trials

That under match conditions, without opponent:

- The robot is capable of leaving the start area
- The robot is able to win a match, without opposition within 90s
- The robot's shutdown system works properly
- The robot's obstacle avoidance system works: The referee can test the system, by placing an obstacle in the robot's path. The obstacle may be slightly to the side of the robot. This obstacle is a fake robot. It has a beacon support like the opponent robot, which may be used by the team if desired. The robot must avoid the obstacle, demonstrating to the referee in a convincing way that it is reacting to the obstacle.

7.1.3. Notes on the approval process

It is mandatory to keep referees informed of any major modifications (functionality, size, etc.) made after approval. The referees will check the modifications and re-approve the robot.



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Actions used during the match which were not demonstrated during the approval process can lead to a disqualification.

Referees can require a robot to subject itself to another approval process at any time during the competition, if there is any doubt about its compliance to the rules.

7.2. Qualification round

The Eurobot organization will try to organize at least five matches for each team during the qualification round. The results of the qualification round decide which teams go through to the final round.

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

- 4 points for a victory,
- 2 points for a draw,
- 1 for a defeat,
- 0 for a scratched match

A score of 0 to 0 is considered to be a double defeat. Hence, each team gets only 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.



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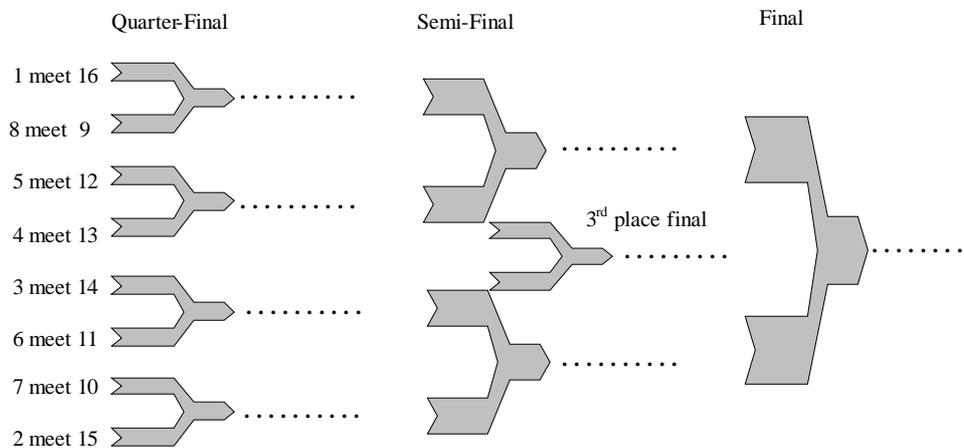
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7.3. Final round

At Eurobot, the first 16 teams from the qualifying phase are selected for the final round. In a national competition the final round may be smaller, depending on the number of registered teams.

During the final phase, matches are on a knockout basis. The matches for the final round are organised as shown in the diagram below.

In the event of a double defeat, a draw or a double disqualification the match is replayed immediately. If this second match is also a double defeat, a draw or a double disqualification, the winner will be determined by the position at the end of the qualification rounds.





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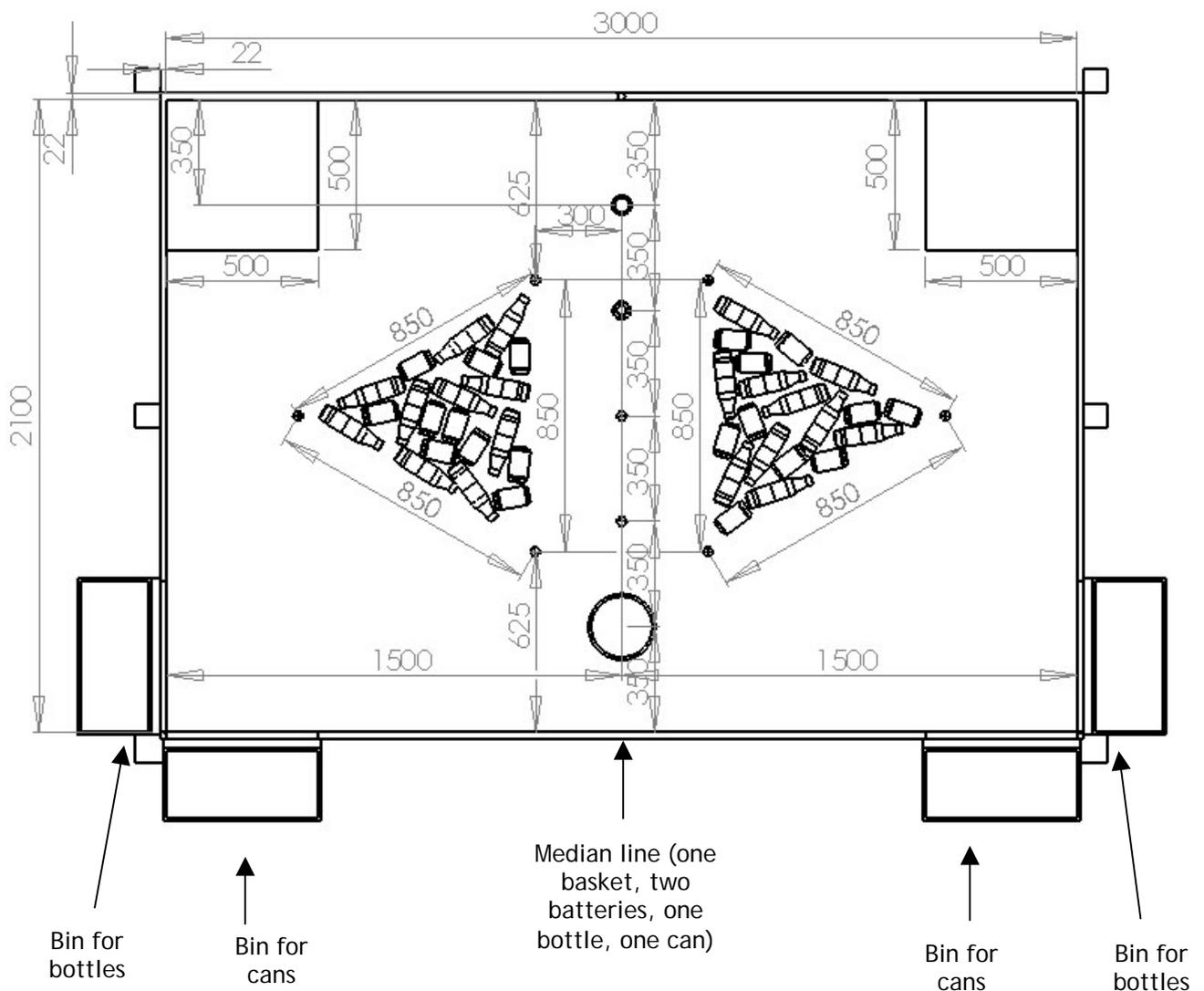
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8. Appendices

8.1. Playing area drawing

Dimensions are given in mm and are subject to the general tolerances defined (see Tolerances, above).

Top View

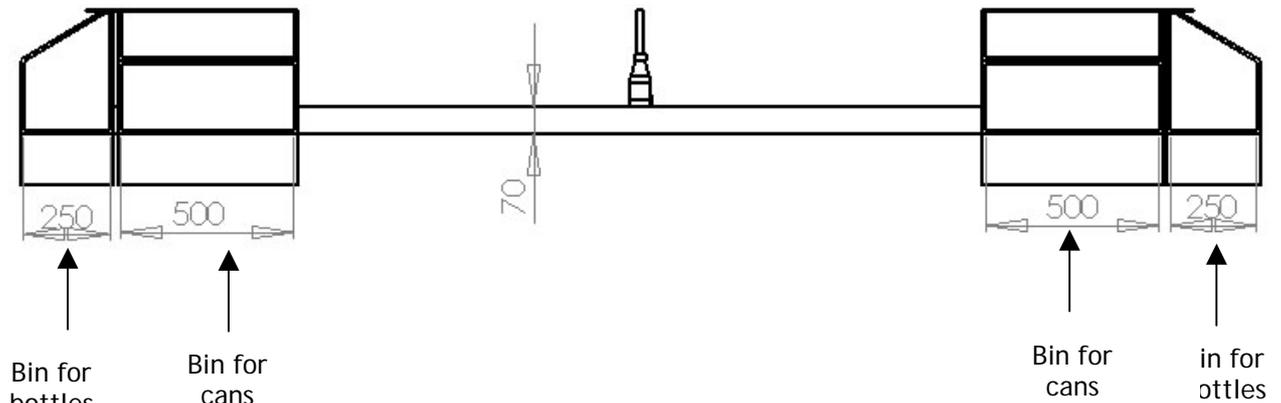




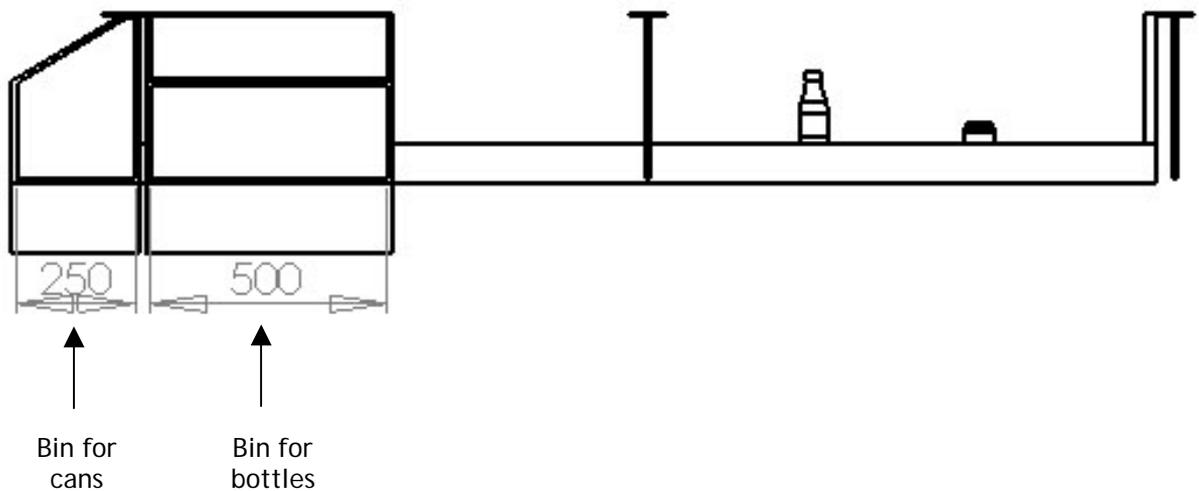
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Face View



Right view



8.2. Reflective tape

This is made of an adhesive retroreflector tape 0,2mm thick and 25mm wide, white in color. Its part number is #XUZB05 at "Telemecanique". The tape is distributed online by "Radiospares" ("RS Electronics") under part 324-1591 (1m length).



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8.3. Polyurethane Foam

The polyurethane foam is used to strengthen and to stabilize the cans. It is sold in every do-it-yourself store.

8.4. Painting references

Element	Colour	Paint Type	Paint Brightness	Reference
Arena floor	Grey (Anthracite)	Acrylic	Satin	RAL 7016
Blue start area, blue border, blue batteries	Blue (sky)	Acrylic (Adhesive tape)	Satin	RAL 5015 (Type RAL 5015)
Red start area, red border, red batteries	Red (fire)	Acrylic (Adhesive tape)	Satin	RAL 3000 (Type RAL 5015)
Basket	White	Acrylic	Satin	RAL 9010
Bottles	Green (bright)	Adhesive tape	Satin	Type 879 PF
Cans	Yellow	Acrylic	Satin	RAL 1018

8.5. Safety

Below you will find a list of safety regulations. This list is not exhaustive - the referees' decisions are final on the dangerousness.

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 also why you must ensure that your systems comply with applicable laws for technical devices.

8.5.1. 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.



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8.5.2. Compressed-air systems

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

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).

8.5.3. Lasers

Max output power for lasers shall be lower than 1mW (0dBm). Technical documentation of the laser device may be required at the approval. It must be supplied in French, English or German.

8.5.4. Powerful light

In case of a high intensity source being used, the light intensity shall be dangerous for the human eye in case of direct illumination. Note: Some powerful LED devices can exceed this limit.