



Line Follower

RULES

Revised Document 12/03/2021

Line Follower | Rules

Revised Document 12/03/2021 - Updated version based on the rules and recommendations drafted by the Line Follower Community of Brazil dated 04/30/2021 and presented by Marcelo Farias.

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1. Introduction

- **Modality Name:** Line Follower
- **Number of Robots per Match:** One
- **Time Trial Duration:** Check item 5 - "Time Trial"
- **Available Classes:** Pro
- **Maximum Robot Dimensions:** 250 x 250 x 200mm
- **Circuit Specifications:** Check item 4 - "The Track"
- **Control Specifications:** Autonomous

NOTE: each robot may participate in only one category during the event, for example: a robot registered in the combat category may not participate in the hockey category and vice versa.

2. The Competition

2.1 Line Follower is a modality in which autonomous robots race on a path specified by a continuous line to determine which one is the fastest.

2.2 The robot that completes the fastest valid lap time among all the time trials will win.

2.3 A briefing will be held before the competition begins to clarify and answer any competitors' questions. It is the responsibility of interested teams to attend the briefing with at least one representative at the agreed-upon time.

2.4 The organization may hold an additional briefing to discuss any unforeseen events, such as something not covered by these rules.

2.5 In the event of any incident that is not covered by these rules or has not been agreed upon in the briefing, the event organization has discretion on how to proceed.

2.6 Judges may request information about the robot if they deem it necessary. The judges have the power to disqualify a robot and make any decision they find relevant during the competition, as long as it is duly justified according to the rules and the briefing.

3. Robot Specifications

3.1 The robots must be fully autonomous and have all the onboard components. They cannot be controlled externally, except for being started or for parameter adjustments.

3.1.1 Robot parameters, such as speed, acceleration, or any other, may be changed, either through keys, buttons, or remotely, provided that the existing software allows it and that it is only done between two attempts.

3.2 The robot cannot exceed 250mm in length, 250mm in width, and 200mm in height, and cannot change its dimensions during the time trial.

3.3 The robot may use thrust methods that increase the normal force relative to the ground. Allowed methods include but are not limited to turbines, propellers, and fans.

3.4 It is the competitor's responsibility to prove that their robot is unique and the same one used throughout the competition for each registration. It is mandatory that the competitor or team with more than one robot registered in the modality adopts non-interchangeable

mechanical elements that can identify the singularity of each robot, such as a mechanical characteristic (color or chassis shape, among others). If the judge deems the differences insufficient, only one of the robots will be authorized to compete, and the others will be disqualified.

4. The Track

4.1 The path is the route defined by a white line that extends from a starting point to a finishing point.

4.2 The track surface is composed of one or more black rubber mats placed on a flat surface, which may have joints. Possible unevenness may occur and will be minimized as much as possible with black tape at the joints. In any case, robots must be able to overcome such unevenness ($\pm 2\text{mm}$).

4.3 No complaints will be accepted regarding track grip, provided that item 4.2 is respected.

4.4 The path is indicated by a white line $19 \pm 1\text{mm}$ wide. The total length of the line will be no more than 60m.

4.5 The line consists of combinations of straight and curved segments. The line may cross over itself.

4.6 When there is an intersection, the intersection angle of the lines will be $90 \pm 5^\circ$ (see figure 1). The parts of the lines 250 mm before and after the intersection will be straight.

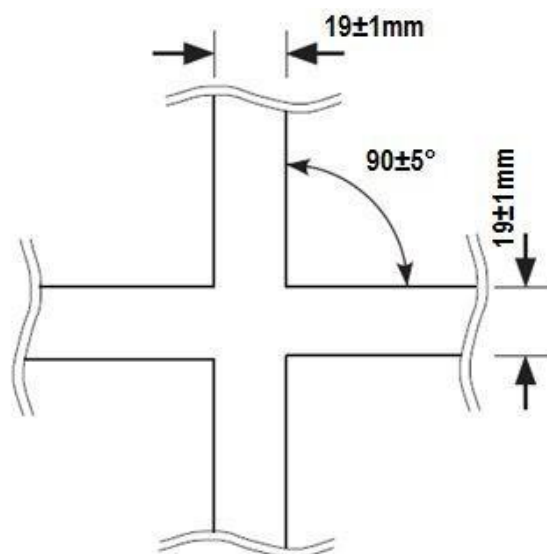


Figure 1: intersection angle and line thickness.

4.7 The starting line and finish line are located on a straight section of the course. The finish line is located one meter behind the starting line. There are markings on the right side of the line (in relation to the direction of the course) indicating the starting and finishing points (see figures 2 and 3).

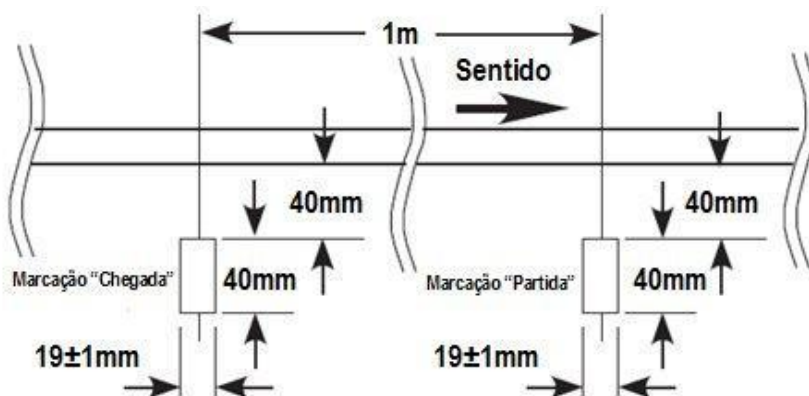


Figure 2: starting and finishing markings according to the direction of the course.

4.8 The area of the track that extends between the starting point and the finishing point, considering 200mm to the right of the line and 200mm to the left of the line, is called the "starting-finishing area" (see figure 3).

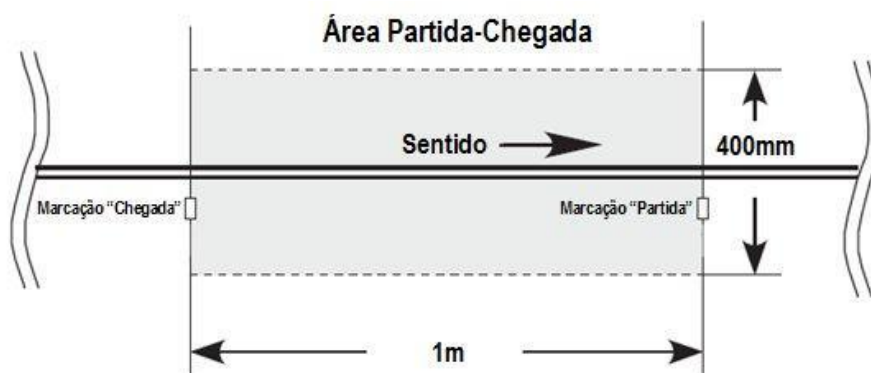


Figure 3: starting-finishing area.

4.9 A starting gate and a finishing gate can be placed on the starting and finishing lines, respectively. These gates must be at least 400mm wide and 200mm tall inside.

4.10 The line that defines the course must maintain a distance of at least 200mm from the starting and finishing gates throughout the entire length of the course.

4.11 The distances between the different sections that make up the course must be at least 200mm.

4.12 The line 250 mm before and after the "starting-finishing area" is straight.

4.13 The radius of the arcs is at least 100 mm (see figure 4).

4.14 There will be a marking on the left side of the line (in relation to the direction of the course) at the point where there is a change in curvature (see figure 4).

4.15 A course can have arcs with different curvatures connected continuously, always observing items 4.13 and 4.14 (see figure 4).

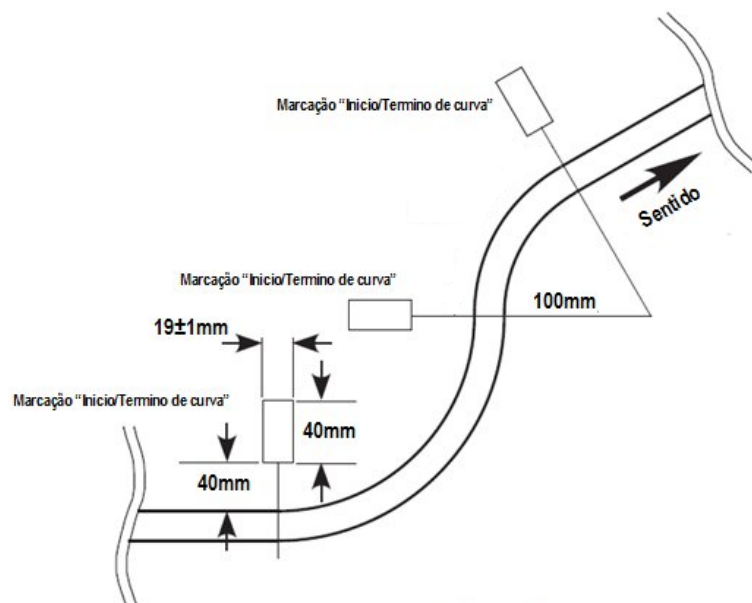


Figure 4: radii and curvature change markings.

4.16 The circuit is assembled horizontally, but parts of it may be inclined up to 5°.

4.17 The shades of the line and the track are subject to possible variations, depending on the supplier of the materials used in their manufacture, but there is a great contrast between the white of the stripe and the black of the track.

4.18 Any objection regarding the conformity of the track must be immediately notified to the organization, provided that the competition has not started. The organization itself will decide how to proceed.

5. Timekeeping

5.1 Timekeeping will be carried out during a period stipulated by the organization and informed in advance. Competitors will take their turns in an organized manner.

5.2 The delimited and signaled area around the official track is called the "timekeeping area".

5.3 Each timekeeping session will have a maximum duration of 5 minutes and will start when the robot enters the "timekeeping area."

5.4 Only 2 (two) members of the team that is taking time are allowed in the "timekeeping area."

5.5 The robot must start from a standstill on the line that defines the course and within the starting-finishing zone, and then proceed around the course in the correct direction.

5.6 The robot must follow the white line when traveling the course. The body of the robot must stay on the line throughout the entire course. If the robot completely exits the white line, it will be considered that the robot has left the course, and the lap will be invalidated.

5.7 A lap will be considered valid when the robot travels the entire course; stops automatically and completely within the "start-finish area," as well as on the line; and remains stationary there for at least 2 seconds.

5.8 Once the attempt has begun, no external interference will be allowed. If it occurs, the attempt will be invalidated. In case of recurrence during the event, the robot will be disqualified.

5.9 If the robot has a remote communication function to be initiated, it is the competitor's responsibility to demonstrate to the judges that this communication cannot be used to stop the robot within the "start-finish area" or alter any other parameter during an attempt. The remote communication device must remain in a location predetermined by the judge during the timing.

5.10 The operator cannot make software or hardware changes to their robot during the timing.

5.10.1 During the timing, it is prohibited to load new software onto the robot.

5.10.2 During the timing, it will be prohibited to make any physical changes to the robot. Only mechanical maintenance of the robot will be allowed between attempts, if the parts that were already part of the robot at the start of the timing are used.

5.11 Three consecutive attempts per timing will be granted, respecting the time limit of the timing.

5.12 The lap time will be measured between the instant the starting sensor of the circuit detects the robot and the instant the arrival sensor of the circuit detects the same robot.

5.13 If the starting or arrival sensor does not work during an attempt, a new chance will be granted to the robot and the duration of the timing will be extended, if necessary and according to the judge's instructions.

5.14 If the team wants to remove their robot from the "timing area", only the attempts made up to that point will be considered and their timing will be finalized.

5.15 Any complaint or claim about non-compliance with the rules during the timing, whether by the competitor conducting the timing or other competitors, must be made during the timing and while the robot object of the claim is still in the "timing area".

5.16 If the competitor or team has more than one registered robot, all of them must necessarily time consecutively.

5.17 The competitor is allowed to remove dust and debris adhered to the tires during timing using only adhesive tape.

5.18 The competitor is allowed to clean or repair the track under the supervision of the judges.

5.19 The lighting, temperature, and humidity will be the same as common enclosed environments. No request for adjustment of environmental conditions will be accepted.

5.20 During the entire timing, the robot must be kept under the supervision of the judges to ensure the correct application of the rules.

5.21 Competitors must always follow the judges' instructions. This is necessary to maintain the good progress of the event. In circumstances that fall outside the scope of the rules and procedures presented here as guides, the decision will be up to the event judges. All decisions made by the judges will be accepted by the RoboCore organization.