

Emerson Automation FCP Kft.

Competition rules

Emerson's AVENTICS Pneumobile Gala Event CEE 2022

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Chapter 1 Race program

1.1 Registration

- a) After arrival (before anything else) all team members have to go to the registration desk of the competition office where they receive the wristbands and the badges required for entry.
- b) Every team member has to understand, accept and sign the Declaration of responsibility.
- c) After the registration the team members can take the pressed air tank provided for the vehicle acceptance check at the service point.

1.2 Vehicle check

- a) Please see Chapter 2.
- b) Station 1: First, every team member have to go the acceptance check station established in the competition centre together with their prepared vehicle and all safety accessories (safety-helmet, protective clothing).
- c) The inspection takes place according to the checking list published on the official website of the competition. Every team gets their own safety data sheet, on which the stewards register the evaluation.
- d) Station 2: is where the stability, steering and the brake system will be inspected.
The teams can repair the noted deficiencies but in this case the acceptance check procedure has to be repeated.

1.3 Free practice training

- a) Teams that have successfully completed the vehicle check can go to free trainin

1.4 Competition briefing

- a) After the acceptance check the organizers will inform the participants about the further program.
- b) During the presentation the rules of the competition and the most important behavior rules will be explained.
- a) **All team members and supporting teachers shall be present at the briefing.**

1.5 Long-distance race

- a) Aim of the race is to take the longest possible distance with one charged tank.
- b) Starting order is according to the pressure drop registered on Wednesday.

1.6 Arcade race

- a) Aim of the race is to run the slalom track in the shortest time.
- b) Starting order according to the Practice/Qualifying session.

1.7 Acceleration race:

- a) Aim of the race is to run the determined section of the track in the shortest possible time competing in parallel pairs.
- b) Due to the track length the result is very much depending on the acceleration of the vehicle.

1.8 Closing ceremony and announcement of result

- a) Following the instructions of the stewards every team and their vehicle shall line up around the podium.
- b) Returning to the boxes takes place after the ceremony following the instructions of the stewards.

Chapter 2 Vehicle check

- a) During vehicle check members of organizers inspect if vehicle is compliant with technical specification and safety rules.
- b) The checklist can be downloaded from www.pneumobil.hu
- c) The check procedure is explained in the following points

2.1 Dimensions and construction check

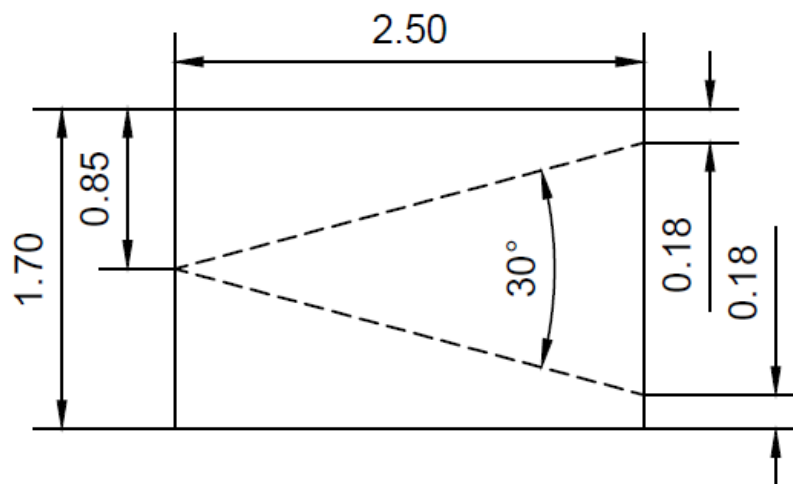


Figure 10. dimensions check template

2.1.1 Dimension check

- a) Vehicle must be inside the test rectangle.
- b) Every part of the vehicle must be in the rectangle.
- c) If any part of vehicle is out of rectangle, vehicle will be disqualified.
- d) Dimensions are measured and checked acc. to 1.2 point

2.1.2 Ground clearance check

- a) The clearance between the bottom of the vehicle and the ground surface must be at least 70 mm, which will be checked with a 70 mm high bumper on the ground.

2.2 Steering check

- a) The jury will check if steering system is working easy and the vehicle can be controlled without difficulties
- b) Play on steering wheel – jury will check a play on steering wheel. Maximum accessible play is 10 degree (measured from maximal left position to maximal right position).
- c) Play between wheels – member of jury will check stability of steering system by moving free wheel left and right. No play between wheels is allowed. In case of one wheel steered this check will not be performed.

2.3 Checking the compliance of safety regulations

- a) According to 1.4 point, all safety features must be presented

2.4 Brake check

- a) Driver with his vehicle have to stand on a tiltable motherboard. Under the vehicle wheels there is a glued emery cloth with 80 grit size.
- b) Service breaks have to be operating, then the board has to be raised to 20°.
- c) In the case of operating service breaks at 20°, the car has to stay in standing position or it can only slip with standing wheels.

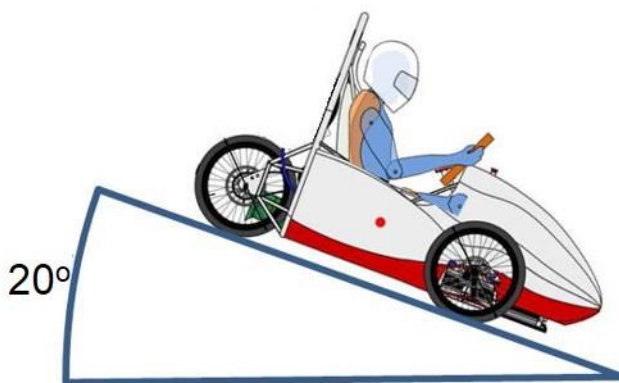


Figure 11. Checking the service breaks

2.5 Parking brake check

- a) The jury will check if parking brake is working properly.
- b) At the actuated position of the parking brake, the vehicle must be able to move (can be pushed away) so that the braked wheels will not turn.

2.6 Checking the stability of the vehicle

- a) Driver with his vehicle have to stand on a tiltable board (Figure 12.). Under the vehicle wheels there is a glued sandpaper with 80 grit size.
- b) Drivers have to be in the car, he has to wear the prescribed protection equipment and he also has to fasten the seat belts tightly.

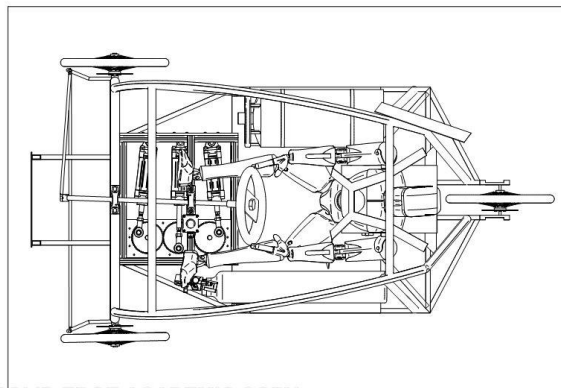
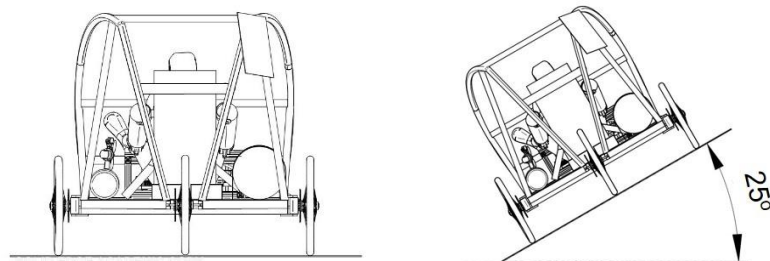


Figure 12. Placement of the car on the board

- c) Then the board is raised to 25° (Figure 13).
- d) None of the vehicle wheels are allowed to lift up before reaching the 25° and they are also not allowed to lift up the 25° final situation.
- e) If the jury realise that the weight distribution of the vehicle is not even, the vehicle must be turned over and they also must check it in this way.
- f) The driver can balance the car but if he fails to do it and the vehicle tilts, then the car failed the checking.

Figure 13. Tipping the motherboards

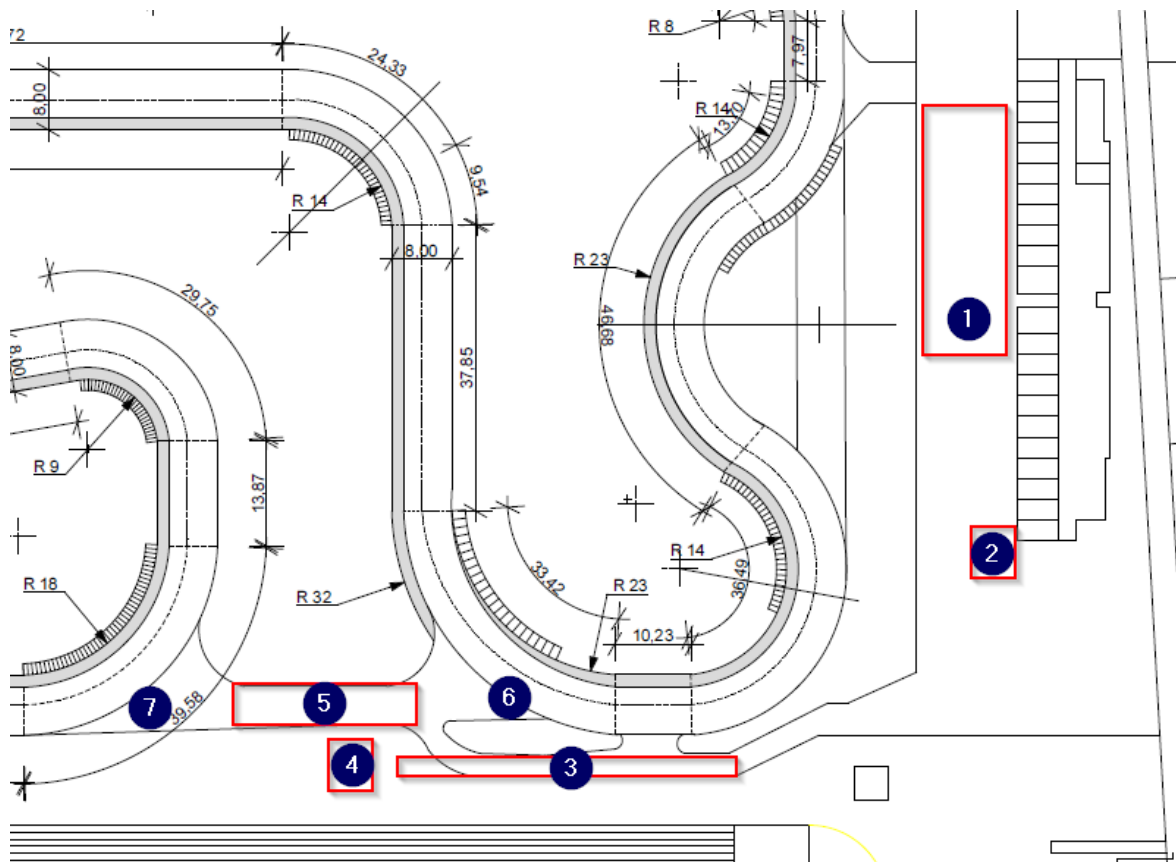


Chapter 3 General rules&informaton for the main event

3.1 General information

- a) Teams, who has not attended the technical check and received a racing permit and a start number cannot enter the race.
- b) Only the driver is allowed to sit in the vehicle in the starting area and on the race track.
- c) "Acrobatic stunts" (dangerous movements) performed in the pit lane and the starting zone as well as exceeding the speed limit of 5 km/h will result in a disqualification.
- d) The jury can call out the team for mechanical checking in any time during the weekend, the vehicle must pass according to the rules of the Vehicle Check. If there is a difference discovered by the examination , the team will be disqualified from the previous races (races which took place before).
- e) The race line for each race event can be found in the appendix

3.2 Map of the event location



1. Parc ferme

- a) Parc ferme is a space for the competitors and pneumobiles.
- b) Only one operation is allowed with jury supervision: charging the battery of the pneumobile.
- c) It is forbidden to carry out fire hazard activities (eg grinding, welding) ferme.

2. Service tent

- a) Service tent provides aid in technical problem
- b) This is the place where the team can carry out fire hazardous activity (welding or grinding)
- c) Teams can pick up the pressure bottle here.

3. Line up space

Lining up takes place on the basis of the start-list handed out for each category. Teams have to line up in the starting lane according to the mentors' instructions. The start lane consists of three stations:

4. Checkpoint

- a) At this point the pneumatic system can be pressurized in the presence of a steward.
- b) The buffer tank filling rules are checked here.
- c) The driver has to sit in the vehicle latest here, and he has to prove that all the safety requirements are met (seat belt is fastened, protective cloth is suitable etc.).
- d) The "racing team members" and the supporting instructor can be present at the checkpoint.

5. Start zone/Pit zone

- a) Here the vehicle and its driver have to be ready for starting the race.
- b) Start will be done from here with the help of the sign of a steward or a starting light.
- c) In the start zone only the driver is allowed to stay.

6. Track entry

7. Track exit / pit entry

3.3 Flag signs:

- a) Waved **red** flag: interruption of the race or training. The vehicles have to return to the pit lane with reduced speed.
- b) Waved **yellow** flag: danger in front of the vehicle. The vehicles have to slow down and be prepared to stop. During the flag signal overtaking is prohibited. The yellow flag valid until the next judge member waving a green flag.
- c) Waved **blue** flag: there is a faster vehicle behind you, which shall be safely let go at the closest suitable track section.

3.4 In case of an accident:

- a) If there is no personal injury and the driver can continue the race by putting the vehicle back to the track without or with the help of stewards, the race can be continued (the used time is included in the race time).
- b) If there is a personal injury the race shall be stopped and the place has to be secured until the further decision of jury.

3.5 In case of technical problems:

- a) If the vehicle has already started the race, but it is not able to finish it without external support due to a technical problem, the team has no further chances in that race category (no new start is allowed), even if the problem occurs due to a failure of element provided by the organizers on the day of competition (e.g. pressure reducer, tank)

Chapter 4 ON THE TRACK – information about the races

4.1 Free Practice

Purpose of the practice: teams can test their vehicles and change their setups.

Procedure of the practice: Starting order depends on the arrival to the starting zone and it will start on the jury's mark. 3-5 vehicles can be on the track at the same time with delayed start. 2 laps can be done on the marked track (qualification 1 track) and there is no recorder laptime. After crossing the finishline, teams must leave the track on a shortened in-lap based on the jury's marks. One team can start many times, but they have to get in lane again in the startzone.

Rules of free practice race:

- a) It is prohibited to drive in the opposite direction.
- b) Smaller technical problems can be repaired only by the driver on the track.
- c) Requesting help from the stewards is allowed only from a standing vehicle by raising a hand.

4.2 Qualifying race (practice 2) (pressure drop measuring):

The purpose of the race: to get qualified for the long-distance race and its race order will be defined based on the results of the qualification race.

Teams can get starting allowance for the long-distance race, if the **average speed is above 15,00 km/h during the qualification race, and pressure drop is not more than 70 bar**. If the qualification race I. is not completed by the team, they are allowed to participate on the long-distance race only if they got the permission from the jury with the acceptance of the determined supplied regulations. The starting place for the start order is a calculated value:

$$\text{Qualifying degree} = \frac{\text{Pressure drop (bar)}}{\text{Average speed } \left(\frac{\text{km}}{\text{h}}\right)}$$

Arrangement of the race: The jury reads the pressure value of the air tank of the vehicle which is ready for race in the starting zone. The vehicle can start after this. Two rounds must be finished on the track and then the actual value of tank's pressure will be read again by the stewards at a designated checkpoint. If the team has completed the race and achieved a result

for the starting allowance for the long-distance race, it is not allowed to run more times, but if the first try was not successful, the team might race again. The total time frame for the qualification is 2 hours from the starting of the first vehicle.

Results of the qualification will be published within 1,5 hours from the finish of the last vehicle's run.

Rules of the race:

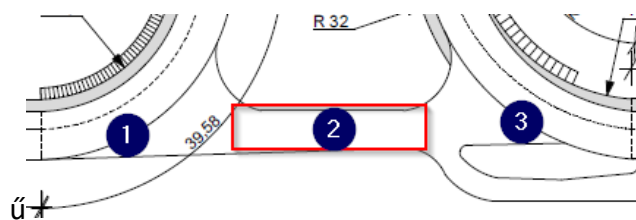
- a) It is prohibited to drive in the opposite direction.
- b) All kinds of stopping the vehicle will be counted into the circle time (average speed).
- c) Smaller technical problems can be repaired only by the driver on the track.
- d) Requesting help from the stewards is allowed only from a standing vehicle by raising a hand.

4.3 Long-distance race:

Aim of the race: drive the longest possible distance with one filled tank.

Planned length of the race track: 930 meter

Arrangement of the race: Lining up in the starting lane must be done on the basis of the issued starting order. A maximum of 6 vehicles can run on the track and the next start is done when a vehicle finishes the race and leaves the track. The vehicle has to take as many rounds on the determined track as possible until it runs out of pressed air. During the race **drivers shall change 2 times**, it takes place off the track in a given "pit stop" zone (2). The "racing team members" are allowed to stay and to carry out repairs only here.



Technical problems arising in other areas of the track can be repaired only by the driver. If the vehicle is not able to pass on by its own, the driver has to indicate it by raising his hand, but he cannot leave the vehicle. The stewards will make a record of the position of the vehicle (the outermost point of its front) and will help to move the vehicle into the pit stop. From the pit stop the "racing team members" can push out the vehicle

Rules of the race:

- a) Deviation from the starting order can be made only once, this means a subordination by 5 positions. If the second start is not successful the vehicle is not allowed to fulfill that race category.
- b) The achieved distance is measured from the outermost point of the vehicle's front.
- c) Maximum of working pressure: 10 bar
- d) Required minimum of average speed is 15 km/h taking all full rounds into consideration.
- e) The average speed within one round is not compulsory, as the average counts. The average speed of the last broken round doesn't count. It is possible to go slowly. If the finish line is not crossed it is not counted in the average speed.
- f) Attention! All finished rounds will be counted in the average speed.

Rules of driver change

- a) Minimum 2 driver exchanges are compulsory.
- b) It is considered a driver change, if the vehicle stops at the traffic cone, the two driver swap places, and the vehicle starts moving.
- c) The vehicle is standing still until the driver gets out, passes the safety-helmet over, another driver takes it on, and fastens the safety belt.
- d) First change can already be done in the first round.
- e) Minimum one round between two changes is compulsory.
- f) Time of the change counts into the average speed.

4.4 Arcade race:

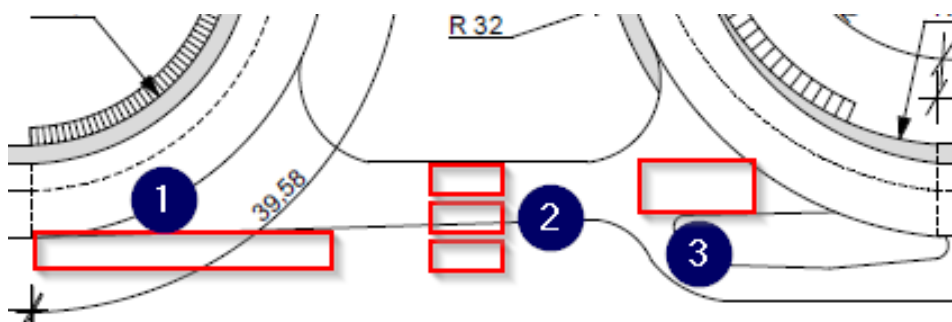
Purpose of the race: Take 5 laps on the track in the shortest possible time by using **three pressure tank**.

Planned length of the race track: 1050 m

Arrangement of the race:

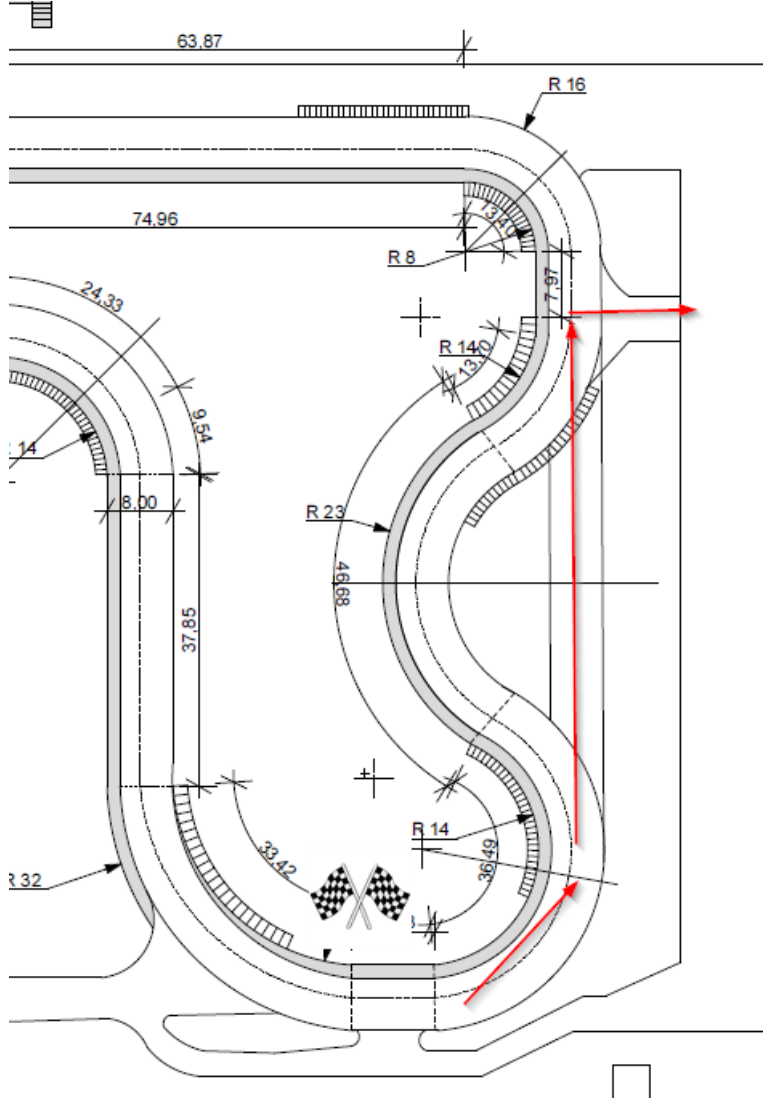
The race will have 3 sessions based on qualifying race. Method of the race is the same in each session.

- a) Vehicles must line up at starting zone according to the defined starting order. Deviating from the defined starting order will generate a position change to the last place of the starting order.
- b) Maximum 10 vehicles will start at the same time
- c) Every vehicle must **complete 5 total laps (cross the light gate 6 times)**, the race ends with checkered flag
- d) Every vehicle must perform **at least one bottle change during the event**
- e) **Maximum 3 bottles can be used** (1 start bottle + 2 bottle change)
- f) Process of bottle change:
 - a. vehicle must stop at stop zone (1), and activate the **pneumatic emergency valve**
 - b. a steward will direct the vehicle to a free spot (2)
 - c. the vehicle must be **pushed by team members** to the spot
 - d. the team members can change the bottle (the reductor is preassembled)
 - e. a steward will **check the fastening of the bottle**, and let the vehicle out
 - f. the vehicle **must be pushed** to the start zone (3)
 - g. the main valve can be opened, and the vehicle can go back to the track



Rules of the race:

- a) The first race will consist of teams 1-8. (based on qualification)
- b) The second race will consist of teams 9-16. (based on qualification)
- c) The first 5th of the 1st and 2nd races will compete each other in the final race
- d) Maximum working pressure: 10 bar
- e) After the checkered flag, vehicles must return to the boxes on the following route:



4.5 Acceleration race:

Purpose of the race: Take the determined section of the track in the shortest possible time

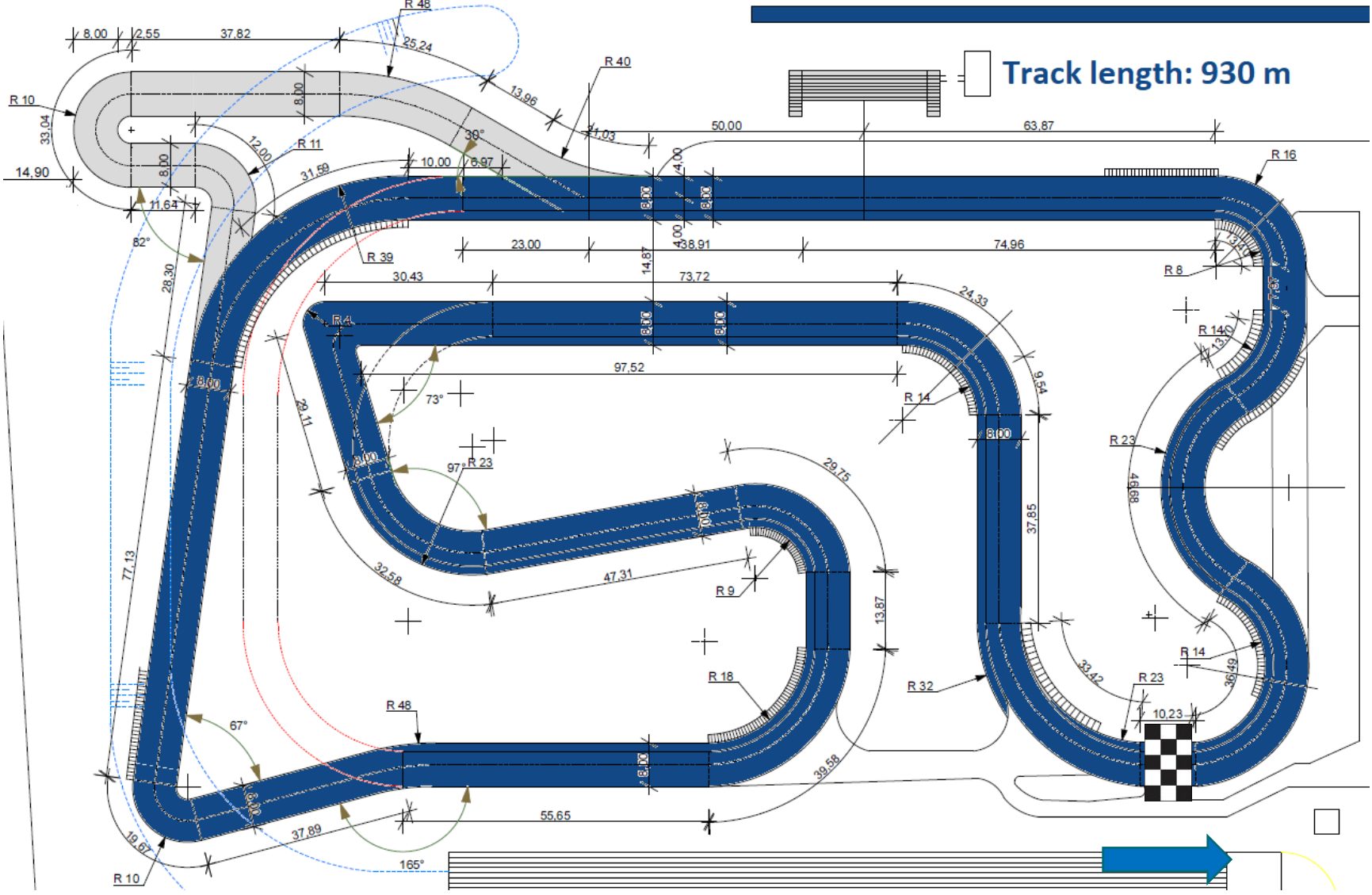
Planned length of the race track: ~ 220 meters.

Arrangement the race: Lining up in the starting lane must be done parallel in pairs on the basis of the issued starting order. The start lamp will give the sign to start from here. The race must be done by following the path of the track and after the finish slow down according to the stewards' signs. After the finish line, there is a determined waiting zone which is an open area. Drivers shall be waiting here until the stewards open the closed section to the boxes.

Rules of the race:

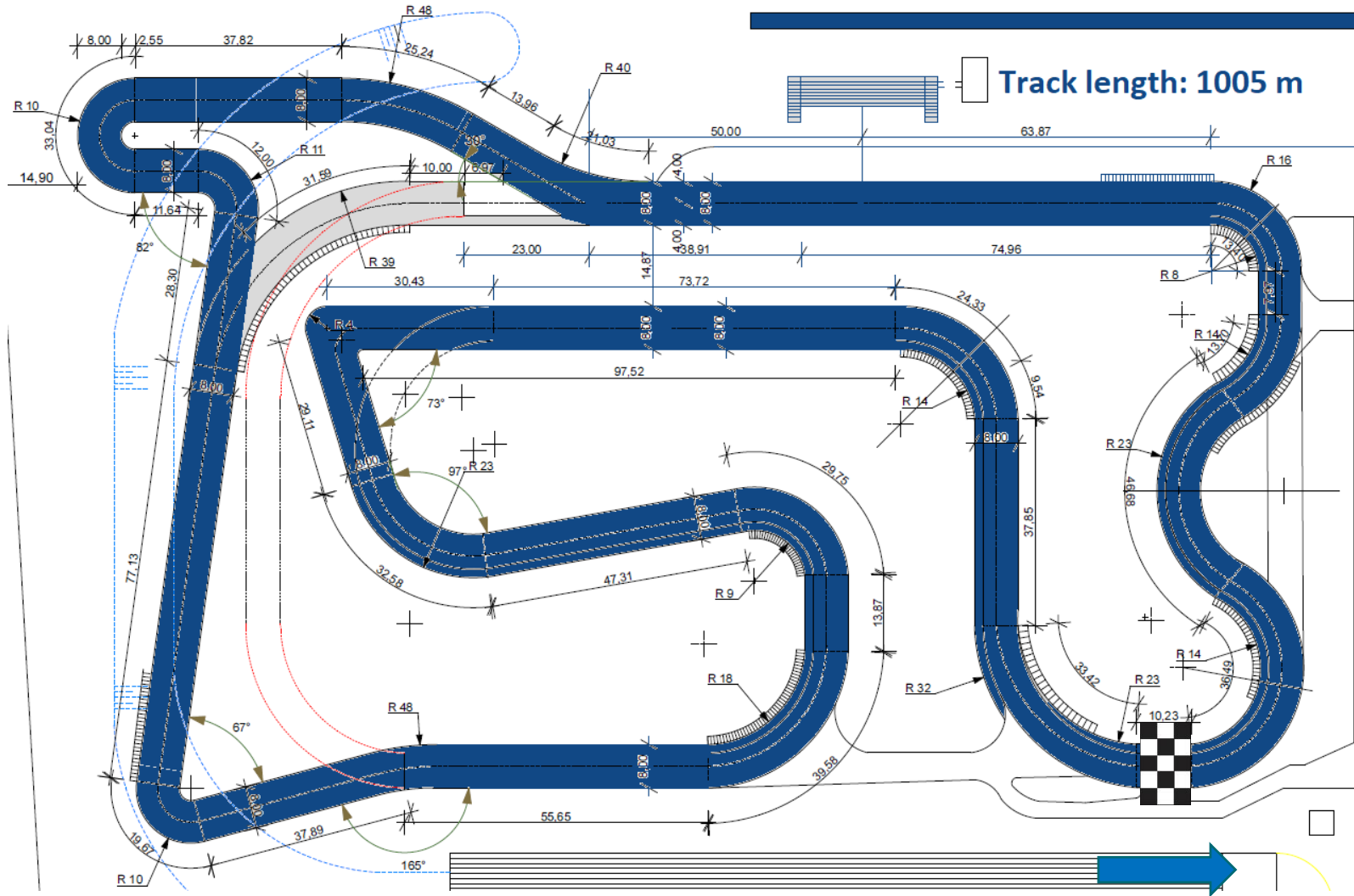
- a) Sides of the parallel track are chosen by a coin-flip
- b) Best time is the winner, highest speed will be measured as well
- c) Operation of the start lamp:
 - a. Every yellow lamp is on (Prepare!)
 - b. Green lamp turns on in 3 seconds (Start!)
- d) Reaction time is included
- e) Jump start is prohibited, vehicles jumped-out or not starting will be disqualified
- f) Maximum working pressure: 10 bar

Appendix – Track layout for long distance race





Appendix – Track layout for arcade race



Appendix – Track layout for arcade race

