

### Competition rules

#### 1. General information

Official name of the competition: **VII. International Rexroth Pneumobil Competition 2014**

Date of the competition: 16-17.05.2014 (Friday & Saturday)

#### Address of the Organizing Committee

**Throughout the year:** Bosch Rexroth Pneumatika Kft  
3300 Eger, Bánki Donát utca 3. Hungary

Bosch Rexroth Kft.  
1149 Budapest, Angol utca 34. Hungary

E-mail: [pneumobil@rexrothpneumatics.hu](mailto:pneumobil@rexrothpneumatics.hu)

Web: [www.pneumobil.hu](http://www.pneumobil.hu)

**On the competition days:** Race office operates at the site of the competition.

#### Official Persons:

Project manager:	PEKK Enikő
Technical leader of the competition:	BOLYKI Ferenc
Leader of the jury:	FÜLEP Richárd
Supporter of the Organizing Committee:	TAMÁS Endre
Even organizer:	Representative of the organizer
Security manager:	Representative of the organizer
Time measurement:	Representative of the organizer

#### 2. Race track

The competition will be held on the closed track of Érsekkert, in Eger.  
For the various races, different tracks will be arranged.

#### 3. Races and categories of the Competition

1. Technical evaluation
2. Long-distance race
3. Slalom track
4. Acceleration race

**Normal category:** At the time of the first registration all team members, while at the day of the competition at least 2 registered team members shall have active student status.

**Senior category:** Those graduated students can register, who took part in one of the last years' competition, and their old Alma Mater provides the previous finished vehicle for them.

#### **4. Rules of the races**

##### **Technical evaluation:**

This part of the competition consists of two segments:

1. Elaborate the documentation and compile the list of required components  
The maximum score of this segment can be 25% of the total points of Technical evaluation
2. Evaluation of the finished vehicle from technical and innovative aspects.  
The maximum score of this segment can be 75% of the total points of Technical evaluation. The „Security acceptance” belongs to this evaluation.

##### **ad 1./ Regulations of the elaboration of documentation:**

- Technical documentation have to prepared **in one PDF file** in the form of „Documentation of technical design” which is available on the homepage. Every technical information, pneumatic circuit diagram have to be included in this document, separate attachments are not admitted.
- The required pneumatic elements have to be listed in the „Request of elements” chart and have to be submitted in a **separate Excel file**.

Every page of the documentation should contain the date and version number. **Later in case of modifications or additions the version number should be changed to the next one and the whole documentation is to be sent in again.**

##### **Documentation can be submitted only after the approval and signature of your supporting instructor.**

- o Deadlines:
  - Term of submitting of documentation: **31.12.2013**
  - Reply (acceptance or further requirements): **20.01.2014**
  - Submitting corrections and supplements: **03.02.2014**
  - Information on final acceptance **17.02.2014**  
(only when corrections were required)
- o In case of delayed or incomplete submitting of documentation the team will be punished with a 50% deduction of the achieved score in the technical category. That will be communicated until item 4 of “Deadlines”.
- o Accepted language of documentation: Hungarian or English.

##### **ad 2./ Evaluation of the finished vehicle from technical and innovative aspects**

###### **Checking has two reasons:**

- Determine that the vehicle can be released for the competition and meeting the rules of the competition. Check the safety requirements, *for details see the point 5*. Teams not fulfilling this point can be excluded from one or the other of the physical races.

- Evaluating the vehicle from the aspect of technical level and comparing it with the other vehicles registered for the competition.

- The team presents the vehicle during operation and illustrates the design and construction process on a “thematic poster” in max. 5 minutes. Detailed content requirements of this will be published later.
- Submitting the design documentation in the required form until the requested deadline, comparison of the documentation with the finished vehicle.
- Solutions of the pneumatic circuit
- Innovative content, inventive solutions
- Applied materials
- Quality of the construction, appearance, design
- Efficiency in other categories of the competition. (The top three teams have to have evaluated results in all physical race categories.)

The jury determines the ranking on the basis of the above aspects.

It is important, that all the teams must be on the vehicle-check in time as the jury needs to see all the vehicles to set up the ranking order.

The team not arriving in time will be disqualified from this category.

### **Physical race categories:**

**General information:** Teams not taking part in the technical acceptance and not having racing permit and start number cannot enter the race. Only the driver is allowed to sit in the vehicle in the starting area and on the race track.

“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.

#### **Flag signs:**

- Waved **red flag**: interruption of the race or training. The vehicles have to return to the pit lane with a low speed.
- 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**.
- Waved **blue flag**: there is a faster vehicle behind us, which shall be safely let go at the closest suitable track section.

**Policy for start line up:** 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:

#### 1. Start office

Vehicles classified to the starting lane according to the start list, get to the start here at the steward. In case of a technical problem here you can ask for a later start position. A team member has to indicate it when the team is called to line up. All team members and the instructor can be present at the start office.

#### 2. Checkpoint

At this point the pneumatic system can be pressurized in the presence of a steward. The buffer tank filling rules are checked here. 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.). Team members and the supporting instructor can be present at the checkpoint.

### 3. Start zone

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

It is compulsory to wear safety motorbike helmet (meeting the traffic safety regulations) by the drivers and the passengers of the vehicles during different races. Use of other safety helmets (e.g. bicycle helmet) is not permitted.

#### **In case of an accident:**

- If there is no personal injury and the driver can continue the race by putting the vehicle back to the lane himself or by the help of stewards, the race can be evaluated (the used time is included in the race time).
- If there is a personal injury the race shall be stopped and the place has to be secured until the further decision of jury.

#### **Qualifying race:**

*The aim of the race* is to prove the compliance with the criteria described in the competition rules. This and the processed result give the starting order of the long-distance race.

The result evaluated in the race 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 bottle of the vehicle which is ready for race in the starting zone. The vehicle can start after this. Two rounds should be finished on the track and then the actual value of bottle's pressure will be read again by the stewards at a designated checkpoint.

#### *Rules of the race:*

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

#### **Long-distance race:**

*Aim of the race:* drive the longest possible distance with one charged bottle.

*Planned length of the race track:* ~580 meter.

*Arrangement of the race:* Lining up in the starting lane should be done on the basis of the issued starting order. A maximum of 10 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 3 times, it takes place off the track in a given "pit stop" zone. 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 team members can push out the vehicle.

*Rules of the race:*

- 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**.
- The achieved distance is measured from the outermost point of the vehicle's front.
- Maximum of working pressure: 10 bar
- Required minimum of average speed is **15 km/h** taking all full rounds into consideration.
- 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.
  - Attention! All finished rounds will be counted in the average speed.
- Minimum 3 driver changes are compulsory.
  - If the vehicle stops and moves on after a change of driver in the given section of the track it is considered to be a relay.
  - 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.
  - First relay can already be done in the first round.
  - Minimum one round between two relays is compulsory.
  - Time of the relay counts into the average speed.

**Category of Slalom:**

Aim of the race: Take the determined slalom track in the shortest possible time.

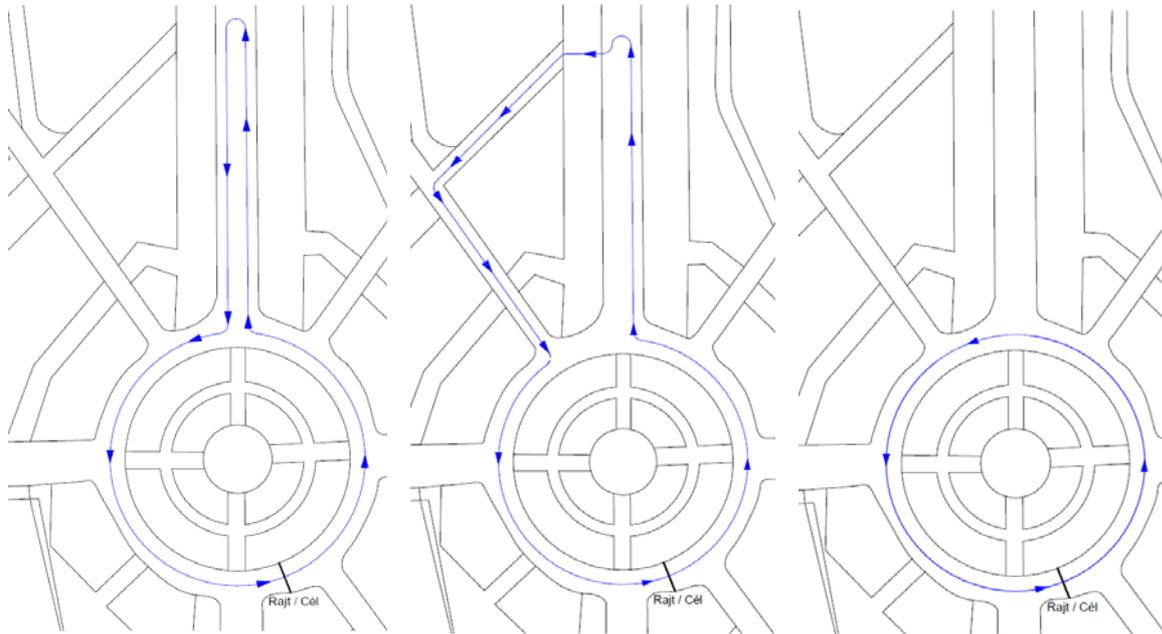
Planned length of the race track: ~800 meters.

Arrangement of the race: three vehicles should line up at starting zone according to the defined starting order, then get to a marked track section for the signal of stewards and the driver should get out from the vehicle. Drivers should go to the defined meeting point – far from the vehicles. Drivers are allowed to wear the helmet, if their vehicle has a seat-belt, but if – according to the technical specifications – no seat-belt is required, drivers should leave the helmet on the vehicle. The race starts at steward's signal according to the standards of Le Mans. So drivers should run to the vehicles, get into the vehicles, tie themselves or put on the helmet and start. In this race, vehicles should run 3 laps on 3 different tracks. Teams are free to select the order of different tracks. At the same time maximum 3 vehicles are allowed to stay on track, overtaking is possible. Taking these conditions into consideration, the sum race time of 3 laps will be rated. In case of not running the 3 different race tracks, but taking no advantages of that (fulfilling min. the defined ~800 m), the race time will be considered and valid; but if the mistake cause any advantages by running shorter distances (less than the defined ~800 m), the result will not be evaluated in this race. Team members are only allowed to stay at a defined place on track and from there they can help the driver. After passing the finish line, the track should be left in a shortened returning lap in accordance with the signal of stewards.

*Rules of the race:*

- Any stop during the race will be counted into the round time.
- Le Mans start from the defined line of track.
- Race time of the 3 laps is the achieved result.
- Maximum working pressure: 10 bar

## Tracks of slalom race:



## Acceleration race:

*Aim 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 should be done parallel in pairs on the basis of the issued starting order. The start lamp will give the sign to start from here. Running over from the own lane to the competitor's lane is prohibited. The race should be done by following the path of the track and after the finish slow down according to the stewards' signs. Leaving the closed track there is an 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:*

- Sides of the parallel track are chosen by a coin-flip
- Best time is the winner
- Highest speed will be measured as well (in the last 5 meters)
- Operation of the start lamp:
  1. Every yellow lamp is on (*Prepare!*)
  2. Green lamp turns on in 3 seconds (*Start!*)
- Reaction time is included
  - Jump start is prohibited
  - Vehicle jumped-out or not starting will be disqualified
- Maximum working pressure: 10 bar

## 5. Arrangement of the race

**Registration:** 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. Every team member has to understand, accept and sign the Declaration of responsibility. After the registration the team members can take the pressed air bottles provided for the vehicle acceptance check at the service point.

Time of registration: 16.05.2014

8:00-11:00

**Security takeover:** only the registered teams can take their vehicles equipped with a pressed air bottle. First every team member have to go the acceptance check station established in the competition centre (Station 1) together with their prepared vehicle and all safety accessories (safety-helmet, protective clothing). 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.

The next checkpoint (Station 2) is the test track in the Érsekkert where the undercarriage and the brake system will be inspected. During the inspection the steering system and the brakes of the vehicle shall be tested. The stewards record these results on the safety data sheet as well. If some of criteria on the safety data sheet are not fulfilled the vehicle can not take part in the competition. The teams can repair the noted deficiencies but in this case the acceptance check procedure has to be repeated. A maximum of 30 points can be collected in the inspection, these points will be taken into consideration in the “Technical evaluation” category.

Time of the security takeover: 16.05.2014. 8:30-12:30

**Evaluation of technical content of the vehicle:** The vehicle shall be shown to the jury at the acceptance check of the competition center (Station 3).

Time of the evaluation: 16.05.2014 8:30-13:00

**Race information:** after the acceptance check the organizers will inform the participants about the further program. During the presentation the rules of the competition and the most important behavior rules will be explained. All team members and supporting teachers shall be present at the presentation.

**City parade:** after the presentation the teams together with their vehicles are lining up according to the instructions of the stewards. The parade is an organized vehicle presentation with police lead. By the end of the program teams go back to the competition centre led by the police.

**Qualifying session:** Qualifying race is compulsory for every team. Starting order of the race is determined by the arrival to the starting lane. Rules of the qualifying race can be found under paragraph 4 ‘Rules of Categories’.

**Training session:** Training opportunity is provided for every racer, within the determined timeframes. Arrival to the competition lane will be the basis of the starting order of the training. One team can take more training rounds, but shall line up in the lane again. The bottle remained from the qualification can be used and one more bottle will be provided by the organizers.

**Long-distance race:** Aim of the race is to take the longest possible distance with one charged bottle. Starting order is according to the pressure drop registered Friday. Rules of the race can be found under paragraph 4 ‘Rules of Categories’.

**Slalom race:** Aim of the race is to run the slalom track in the shortest time. Starting order according to the Qualifying session. Rules of the race can be found under paragraph 4 of ‘Rules of Categories’.

**Acceleration race:** Aim of the race is to run the determined section of the track in the shortest possible time competing in parallel pairs. Due to the track length the result is very much depending on the acceleration of the vehicle. Rules of the race can be found under paragraph 4 ‘Rules of Categories’.

**Announcement of result:** Following the instructions of the stewards every team and their vehicle shall line up around the podium. Returning to the boxes takes place after the ceremony following the instructions of the stewards.

## **6. Application, conditions of registration**

Teams of universities or colleges consisting of maximum 4 members can register for the competition (Max. 3 teams per institution and race category.)

The application has to include the personal data of the responsible team leader (technical supporting instructor) who has to be the professor of the given institution. The application shall include the availability data of the contact person of the team. The contact person can be one of the team members as well.

The “**Application form**” for the competition can be downloaded from the website, and shall be sent to the entry address.

## **7. Prizes**

Prizes will be distributed according to following evaluation categories:

1. Technical evaluation
2. Long-distance race
3. Slalom race
4. Acceleration race

In „normal” category the first three teams of all evaluation categories/races will be awarded, while in „senior” category the overall champion will be awarded.

Winner of „**Best Pneumobile of Rexroth 2014**” will be chosen by the jury – one team out of the winners of „normal” category.

Every awarded team will receive valuable prizes, in addition to they will get certificate and cup too.

Regarding special awards or prizes further information will be provided for the teams on the spot.

## **8. Responsibility**

Race participants release the organizer, the authorized event officials, their employees and representatives from every liability related to any damages caused by the participants jointly or separately to assets or third persons during the competition. The organizers are not responsible for supplies and objects left unattended in the depot.

## **9. Start number plates and publicity**

- Two separated even surfaces with size of A3 shall be provided on the front and on the right or left side of the vehicle for the start number plates. These surfaces can be directly on the chassis or on extra boards made for this purpose.  
Without these surfaces the vehicle cannot be approved for competition.
- Logo and name of the university or collage should be placed on the vehicle in an A4 size.
- Sponsor advertisements can be placed on the vehicle in max. size of A4. Maximum two copies of the same advertisement. Advertisements of competitors of Rexroth are not allowed to place on the vehicles. In case of doubts the team has to clarify the matter with the organizing committee prior to the race.
- The members of the teams shall wear the T-shirt of Rexroth sent to the leaders of the teams one month before the competition. Sponsor logos can be placed on the T-shirt.
- No advertisements can be placed on or around the speedway or the depot. Exceptions to this prohibition are the advertisements and logos which are painted on the transport vehicles of the teams furthermore on external race cars, on the team member's clothes, and on other devices of the event (signboards, umbrellas etc.). The advertisements of competitors of Rexroth are not allowed to place even on the above equipment.
- Any prohibited advertisements will be removed by the organizers.

## **10. Rexroth elements**

- The conversion of the energy of compressed air to mechanical energy should be performed by the pneumatic cylinders and control valves of Bosch Rexroth.
- The applicable Rexroth pneumatic components can be selected from the list published on the home page of the competition.
- Apart from the drive chain the vehicle can have other pneumatically operated functions as well. In this case a special agreement is required for financing the components.

Eger, 25<sup>th</sup> September 2013