|  |
| --- |
| <University, College name> <Name of the faculity> |
| Technical documentation |
| <Race number> |
| <Team name> |
| 14th International AVENTICS Pneumobile Competition |



|  |
| --- |
|  |

Cheat Sheet for completing the documentation

Detailed requirements and responding points assigned to it are presented in tables below. We would like to see these details presented in the documentation, with drawings, calculations and SHORT descriptions. The points marked as KO are mandatory, we will reject the documentation if even one of them is missing.

* + - 1. **Compliance with safety rules**

|  |  |
| --- | --- |
| **Safety regulations** | **KO** |
| **Accepting the general safety rules** | **KO** |
| **Presentation of the dimension-related rules**  | **KO** |
| **Tank and pressure reducer cannot be higher than 50% of vehicle wheelbase.** | **KO** |
| **The highest point of the buffer tank cannot be higher than 60% of the width (max.1020 mm)** | **KO** |
| **The engine’s highest mechanical element point is 60% of the vehicle width. (Max:1020 mm)**  | **KO** |
| **Presenting the wheel base (4 wheeled vechicles)** | **KO** |
| **Presenting the angle of wheel positin (3 wheeled vechicle)** | **KO** |
| **Mounting and position of main pressure tank** | **KO** |
| **Compressed air tank must be placed within the vehicle frame that way that assures protection against impact during a crash.** | **KO** |
| **Presenting the protection of pressure tank (training and race tank as well)** | **KO** |
| **Presenting the protection of pressure reducer** | **KO** |
| **Presenting the visibility of pressure reducer** | **KO** |
| **Pressure tank mounting** | **KO** |
| **Mounting and protection of buffer tank**  | **KO** |
| **Buffer tank must be placed within the vehicle frame that way that assures protection against impact during a crash.** | **KO** |
| **Presenting the protection of the connection of buffer tank** | **KO** |
| **Pressure tank mounting** | **KO** |
| **Engine placement** | **KO** |
| **Rajz, ami megmutatja a motor járművön belül elfoglalt helyzetét. A motornak a jármű vázán belül kell lennie, tekintettel a műszaki követelményekre.**  | **KO** |
| **A vezetőt a motor és a hajtómű mozgó alkatrészeitől védőfallal kell elválasztani.** | **KO** |
| **Brakes** | **KO** |
| **Dual brake system (figures, remark)** | **KO** |
| **Calculation of brake distance** | **KO** |
| **Parking brake** | **KO** |
| **Brake light** | **KO** |
| **Turning radius** | **KO** |
| **Showing, that the turning radius is less than 8m** | **KO** |

* + - 1. **Presentation of vehicle**

|  |  |
| --- | --- |
| **General presentation of the design and construction of the vehicle** | **Points** |
| **A brief description of the vehicle.** | **5** |
| **Presenting the uniqe features to the jury.** |
| **If the vehicle was not manufactured this year, a presentation of previous years' experience and results** |
| **3D model of the vehicle** |  |
| **Image of a 3D model showing a general view of the entire vehicle.** | **2** |
| **Presentation of vehicle dimensions** |  |
| **The plane projections of the vehicle (top view, front view, side view) by specifying the main dimensions and marking the center of gravity.** | **3** |
| **The total length, width and maximum height shall be indicated.** |
| **Indication of wheel diameter** |
| **Indication of ground clearance** |
| **Frame presentation, CAD model** |  |
| **Description of materials used and execution.** | **3** |
| **Description of the fasteners used.** |
| **3D or 2D CAD model about the vehicle chassis** |
| **Demonstration of the mechanical strength of the frame by calculation or simulation.** |
| **Vehicle Starting Plates** |   |
| **Description of the vehicle body, materials used.** | **3** |
| **Indication of the position of the start plates on the body** |

* + - 1. **Engine and drive chain presentation**

|  |  |
| --- | --- |
| **A detailed description of the engine structure** | **Points** |
| **Drawings showing the structure of the engine in detail.** | **10** |
| **The cylinders and mountings purchased from AVENTICSTM and the linear actuators should be marked on the drawings.** |
| **Kinematic diagram and description of the movement of the engine from the cylinders to the crankshaft.** |
| **Drive Chain Introduction** |  |
| **Kinematic sketch of the drive train from crankshaft to driven wheel (s).** | **5** |
| **Calculations** |  |
| **Calculations of:** | **5** |
| **(a) Calculation of the total volume of the cylinders.** |
| **(b) Nominal speed of the piston rod at 6.3 bar.** |
| **(c) Crankshaft speed and torque per minute.** |
| **(e) Torque and speed calculations on wheel at 6.3 bar supply.** |
| **(f) A description of the maximum speed of the vehicle is required.** |

* + - 1. **Presentation of control system**

|  |  |
| --- | --- |
| **Schematic diagram of pneumatics** | **Points** |
| **Schematic diagram of pneumatics made with D&C scheme editor.** | **12** |
| **The schematic drawing must include all cylinders, valves, air preparation elements and pressure sensors. It is not necessary to present the connectors.** |
| **Description of the standard emergency stop system used.** |
| **The item numbers must match those of PneuShop.** |
| **Pneumatic drawing element list** |  |
| **Elements list of pneumatic drawing elements (cylinders, valves, sensors) - item number, material number, designation, quantity** | **3** |
| **The item numbers must match those of PneuShop.** |
| **Schematic diagram of electronics** |  |
| **To present a schematic diagram of electronics on one or more A4 pages.** | **10** |
| **The electronic circuit must include all electronic components, with particular regard to the sensors, electropneumatic valves required.** |
| **\* Teams that do not use electronics will automatically receive a maximum score of 8.2.** |
| **Description of the control system** |  |
| **Detailed description of control functions: speed control, operating modes** | **20** |
| **The description must include all the elements (primarily valves) in the drawings, with the item number shown on the drawings.** |
| **The function of all pneumatic elements (valves, flow regulators, pressure regulators, sensors) must be indicated** |
| **At this point, the control system used must be specified.** |
| **If the team applies for the AV Valve Island, this section should explain its intended use** |

* + - 1. **Suspension and steering wheel presentation**

|  |  |
| --- | --- |
| **Front wheels** | **Points** |
| **Diagram and description of the front wheel suspension.** | **3** |
| **Description of the braking system used.** |
| **Rear wheels** |  |
| **Diagram and description of rear wheel suspension.** | **3** |
| **Description of the braking system used.** |
| **Introduction of the steering gear** |  |
| **Diagram and description of used steering gear and operation.** | **3** |
| **Ackermann's Trapeze Drawing (Preferred)** |

* + - 1. **Innovation**

|  |  |
| --- | --- |
| **Innovation** | **Points** |
| **High efficiency and innovative use of pneumatic components used in the engine.** | **10** |
| **New and innovative solutions in the vehicle, taking into account the structure and function.** |
| **Application of new solutions and / or technologies.** |
| **Other innovation results** |

Content

[1. Technical data sheet 5](#_Toc48140435)

[2. Safety regulations 6](#_Toc48140436)

[2.1 Accenpting the general safety rules 6](#_Toc48140437)

[2.2 Presentation of the dimension-related rules (Drawing is mandatory) 7](#_Toc48140438)

[2.3 Mounting and protection of pressure tank (Drawing is mandatory) 7](#_Toc48140439)

[2.4 Mounting and protection of buffer tank (Drawing is mandatory) 7](#_Toc48140440)

[2.5 Engine placement (Drawing is mandatory) 7](#_Toc48140441)

[2.6 Brakes (Drawing is mandatory) 7](#_Toc48140442)

[2.7 Turning Radius (Drawing is mandatory) 7](#_Toc48140443)

[3. Presentation of vehicle 8](#_Toc48140444)

[3.1 General information about the Pneumobile 8](#_Toc48140445)

[3.2 3D model of the vechicle 8](#_Toc48140446)

[3.3 Dimensions 8](#_Toc48140447)

[3.4 Chassis, CAD model 8](#_Toc48140448)

[3.5 Design of body, starting plates 8](#_Toc48140449)

[4. Engine and drive chain 9](#_Toc48140450)

[4.1 Engine construction 9](#_Toc48140451)

[4.2 Drive Chain 9](#_Toc48140452)

[4.3 Calculation 9](#_Toc48140453)

[5. Control system 10](#_Toc48140454)

[5.1 Pneumatic scheme 10](#_Toc48140455)

[5.2 BOM of Pneumatic scheme 10](#_Toc48140456)

[5.3 Electronic scheme 10](#_Toc48140457)

[5.4 Details of the control system 10](#_Toc48140458)

[6. Suspension, brake and steering system 11](#_Toc48140459)

[6.1 Front wheels 11](#_Toc48140460)

[6.2 Rear wheels 11](#_Toc48140461)

[6.3 Steering system 11](#_Toc48140462)

[7. Innováció 12](#_Toc48140463)

# Technical data sheet

|  |
| --- |
| **PNEUMOBILE 2021 TECHNICAL DATA SHEET** |
| **START NUMBER:** |   |
| **NAME OF TEAM:** |   |
| **NAME OF UNIVERSITY:** |   |
| **TEAM-MEMBERS** | **Year/class:** |
|   |   |
|   |   |
|   |   |
|   |   |
|   |   |
|   |   |
| **NAME OF SUPPORTING INSTRUCTOR:** |   |
|   |
| **YEAR OF THE VEHICLE WAS BUILT** |  |  |   |   |
|  |  |  |  |  |   |
| **VEHICLE VERSION** | NEW/REBUILT |  |  |   |   |
|   |
| **PLANNED TOP SPEED** |   | km/h |
| **PLANNED OPERATIONAL DISTANCE** |   | m |
|  |
| **MAIN FEATURES OF THE PNEUMOBILE** |   |   |
|   | LENGTH |  |   |   | mm |
|   | WIDTH |  |   |   | mm |
|   | MASS |  |   |   | kg |
|   | AXLE-BASE |  |   |   | mm |
|   | TRACK WIDTH |  |   |   | mm |
|   | NUMBER OF WHEELS |   |   | pcs |
|   | DIAMETER OF STEERED WHEEL(S |   | mm |
|   | DIAMETER OF DRIVEN WHEELS |   |   | mm |
|   | NUMBER OF DRIVEN WHEELS |   |   | db |
|   |
| **ENGINE-CONSTRUCTION** |   |
|  |   |   |   |   |   |
| **CONTROL SYSTEM** |   |
|   |  |  |  |  |   |
| **FEATURES OF THE PNEU-ENGINE** |  |  |  |   |
|   | NUMBER OF CYLINDERS IN THE ENGINE  |   | db |
|   | CYLINDER DIAMETER |  |   | mm |
|   | STROKE |  |  |   | mm |
|   | DISPLACEMENT |  |  |   | cm3 |
|   | RPM OF THE ENGINE-AXLE |  |   | 1/min |
|   | TORQUE OF THE ENGINE  |  |   | Nm |
|   |   |   |   |   |   |

# Safety regulations

### Accenpting the general safety rules

Undersigned teacher, from the University/College, as supporter teacher, declare that I have checked the technical documentation of the vehicle. Our team is committed to paying particular attention to the following guidelines when designing and constructing a vehicle. By submitting the technical documentation, we accept that non-compliance with the points of section 2 of the design documentation may result in disqualification.

Additionally I declare that the members of team have made the technical documentation.

 , 2020.

signature

1. Wearing a head protection helmet is obligatory.
2. If the helmet does not have plexi to protect the face, it is obligatory to wear goggles.
3. Drivers have to wear closed shoes and gloves.
4. Drivers should wear long sleeve clothing (tops/shirts) and long trouseres during all races
5. All the safety functions need to be in the driver’s reach.
6. Driver should sit in a seat equipped with a four fixing position belt, that is able to fasten the driver so that the shifting is prevented.
7. Drivers have to be able to leave the car within 15 seconds and they have to be able cut off the voltage and compresed air supply of the vehicle.
8. Vehicle must be equipped with two rear-view mirrors
9. The vechicle must be equipped with an electrical safety switch, which can be operated from the outside.
10. The electrical emergency swith must be marked with red-white triangle (red frame, white inside).
11. Using of the predesigned pneumatic safety circuit is obligatory.
12. Safety circuit should be mounted on red plate and placed in such place that allows easy access to it for driver and from outside of vehicle.
13. The frame must protect the driver’s leg.
14. The battery must be placed in an IP54 protection class casing, which prevents the batteries from moving.

Signature of Team Members

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |

### Presentation of the dimension-related rules (Drawing is mandatory)

### Mounting and protection of pressure tank (Drawing is mandatory)

### Mounting and protection of buffer tank (Drawing is mandatory)

### Engine placement (Drawing is mandatory)

### Brakes (Drawing is mandatory)

### Turning Radius (Drawing is mandatory)

# Presentation of vehicle

### 3.1 General information about the Pneumobile

### 3.2 3D model of the vechicle

### 3.3 Dimensions

### 3.4 Chassis, CAD model

### 3.5 Design of body, starting plates

# Engine and drive chain

### 4.1 Engine construction

### 4.2 Drive Chain

### 4.3 Calculation

# Control system

### 5.1 Pneumatic scheme

### 5.2 BOM of Pneumatic scheme

### 5.3 Electronic scheme

### 5.4 Details of the control system

# Suspension, brake and steering system

### 6.1 Front wheels

### 6.2 Rear wheels

### 6.3 Steering system

# Innováció